JULY 1936

ELECTRICAL CONTRACTING

ENGINEERING • INSTALLATION • REPAIRING • MARKETING

Garden Lighting Specifications . . . *in this issue, Page 21*

G-E PRODUCTS THAT PROFIT THE CONTRACTOR

INSTRUMENTS

Can Help You Get New Business

TYPE AP-9, INDICATING

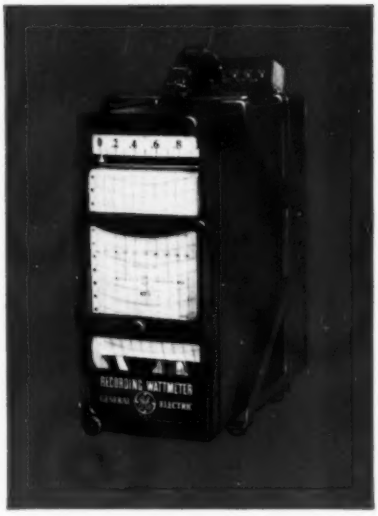
This line includes voltmeters, milliammeters, ammeters, and wattmeters. Size: 2 1/2 by 4 3/4 by 6 1/2 in. Weight: 3 1/2 lb. Handy, compact, sturdy, highly accurate for size, and built for long-time service. Net prices begin at $30. (Bulletin GEA-1784)

INSTRUMENTS enable you to point out to an industrial customer where improvements can be made—with resultant savings to him and new business for you.

Moreover, you can better your service to customers and gain added good will. A motor kicks up, a breaker blows mysteriously. You are called upon to find the reason why. That you can do only with instruments.

For such reasons, electrical contractors everywhere are finding many profitable uses for testing instruments. The two illustrated are typical of lines which have proved ideal for this service.

If you would like to know more about them, we shall be glad to send you copies of Bulletins GEA-1061 and GEA-1784. Address the nearest G-E sales office or General Electric Company, Dept. 6B-201, Schenectady, New York.



TYPE CD, RECORDING

A complete line of portable instruments for a-c and d-c measurements. Timed and powered by Telechron motor or 8-day clock. Easy to handle and use; accurate to within 1 per cent of full-scale value. Prices as low as $80, net. (Bulletin GEA-1061)

TIME SWITCHES
Profitable to Sell

Every day more opportunities spring up where you can sell time switches—for the control of show-window and sign lighting, flood-lighting, water heaters, and others. You make a good profit on the switch itself, and also on the wiring, fixtures, and accessories.

G-E time switches are easy to install, require no maintenance; and because of their reliability they stay sold. See the new features in Bulletin GEA-1427.

CABLE That Gives
Lasting Service

You will have a lot of satisfied customers if you install G-E insulated cable. It's reliable and will give the best of service. You can get it in every type, size, and voltage for every application. Shipments can be made promptly because many sizes are carried in stock. See the G-E distributor nearest you.

Ask about G-E varnished-cambric line wire. It's a best seller. See Bulletin GEA-2103.

430-66

GENERAL ELECTRIC

HOWARD EHRLICH
Vice-president
S. B. WILLIAMS
Editor
F. J. SEILER
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Manager

Established 1901

INSTALLATION
ENGINEERING
MAINTENANCE
REPAIRING
MANAGEMENT
MARKETING

for

ELECTRICAL CONTRACTORS
INDUSTRIAL
COMMERCIAL
RESIDENTIAL

ELECTRICAL INSPECTORS

ENGINEERS

SERVICE SHOPS

and others engaged in the business of electrical construction

Official Publication
of the
National Electrical
Contractors Association

ELECTRICAL CONTRACTING

With which is consolidated
The Electragist and Electrical Record

Vol. 35 **July, 1936** No. 9

CONTENTS

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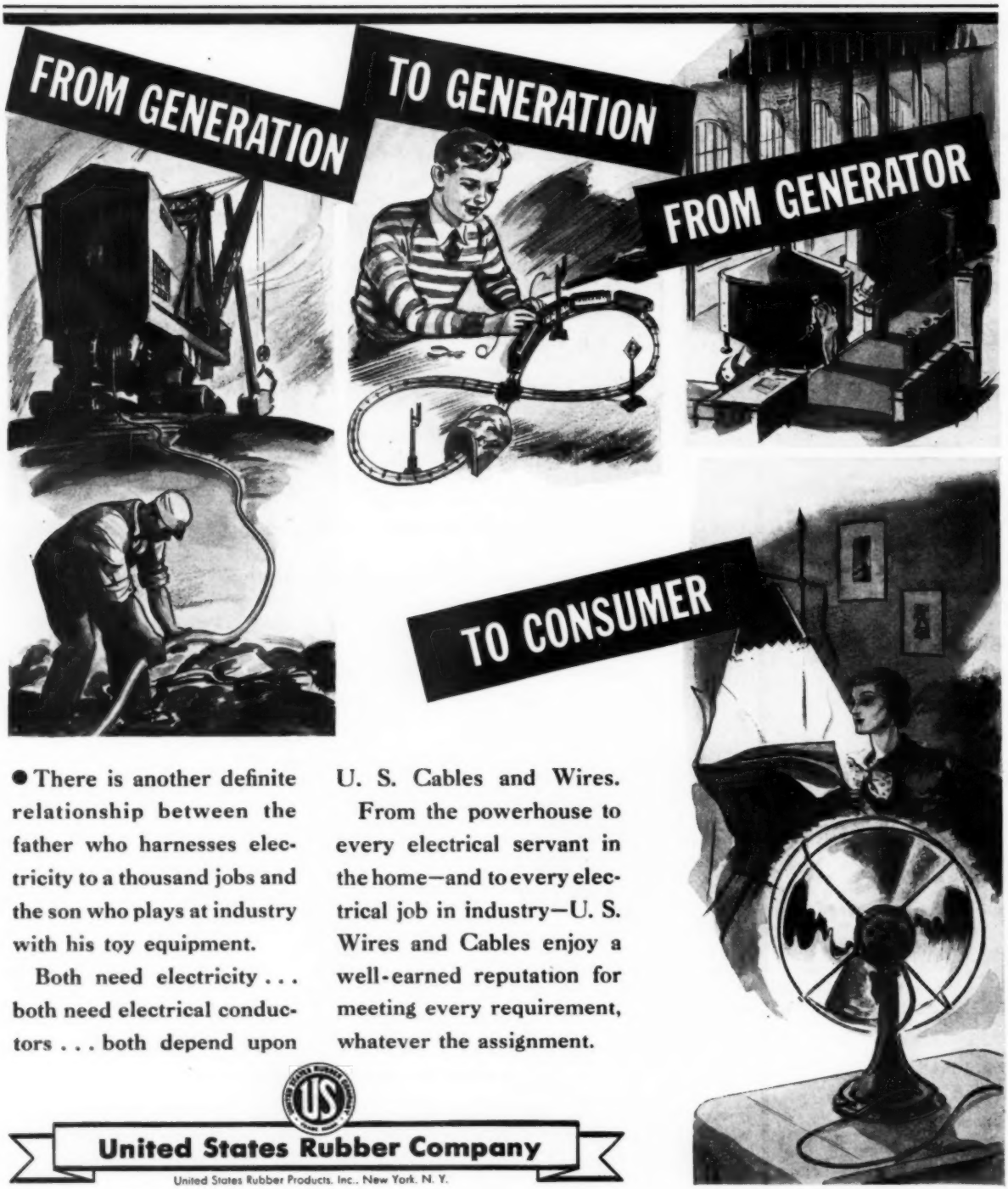
THEY COME NO LARGER AND NO SMALLER THAN U. S. CABLES AND WIRES!



● There is another definite relationship between the father who harnesses electricity to a thousand jobs and the son who plays at industry with his toy equipment.

Both need electricity . . . both need electrical conductors . . . both depend upon U. S. Cables and Wires.

From the powerhouse to every electrical servant in the home—and to every electrical job in industry—U. S. Wires and Cables enjoy a well-earned reputation for meeting every requirement, whatever the assignment.

United States Rubber Company

United States Rubber Products, Inc., New York, N. Y.

EC
JULY 1936

Leadership

SUCCESSFUL business and trade paper publishers always strive for what is known as "leadership," not from the standpoint of competition with some other paper, but rather in terms of service to its reader field. Leadership can be expressed in many ways.

A PUBLICATION may exercise leadership by crusading and getting its field to follow after. When this is constructive, and it may be either creative, such as the adequate wiring editorial program now being conducted by ELECTRICAL CONTRACTING, or it may be critical, such as our opposition to the licensing of journeymen, it is of benefit to the industry in terms of markets, or policies, or trade relations. Because such crusades generally extend over a long period only a few such activities can be carried on.

ANOTHER form of leadership is guidance, wherein a publication by focusing attention on certain methods can direct the progress of practice into channels that bring efficiency, lower costs, better products. This practical guidance is offered in ELECTRICAL CONTRACTING in its numerous departments and methods articles all gathered by our own staff in the field after investigation has shown their practicality.

A THIRD form of leadership is educational wherein the reader's fund of information relative to some product or process is increased, or where questions are answered. Our regular Code Chats section has been a powerful factor in increasing the general education of contractors and inspectors with respect to the National Electrical Code.

LEADERSHIP also takes the form of responsibility to do certain things that no other agency is set up to do, such as to gather statistics, break down markets. Or again leadership may be inspirational wherein it can encourage an industry to do better and bigger things.

FINALLY leadership is economic in nature, wherein the readers are kept abreast of the changing conditions in the field with respect to products, methods, competition, new forces in distribution, new markets, legislation and any other activities that can affect the general welfare of the field.

ELECTRICAL CONTRACTING has always been willing to assume these responsibilities that go with leadership, confident that it is only by such leadership that lasting success can be achieved.

P&S

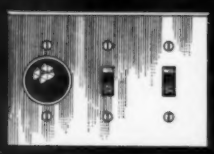
originators of the

DESPARD

LINE OF WIRING DEVICES

Brings these benefits to the Contractor

1. MOST COMPLETE INTERCHANGEABLE WIRING DEVICE LINE IN THE WORLD.
2. LESS MATERIAL TO BUY AND CARRY.
3. OVER 60,000 COMBINATIONS FROM 22 DEVICES AND AN ASSORTMENT OF WALL PLATES.
4. MAKE ANY COMBINATION RIGHT ON THE JOB.
5. TREMENDOUS SAVING IN TIME AND LABOR.
6. A COMPLETE SERVICE IN ONE LINE.
7. A MODERN BUSINESS GETTER.

THE OLD WAY		P&S THE DESPARD WAY	
			
1-Combination Brass Plate (3-gang) . .	$1.36	1-One Gang P&S Despard Brass Plate	$.32½
1-Pilot Light Receptacle	1.00	1-P&S Despard Pilot Light Receptacle	.95½
2-Single Pole Switches	.66	2-P&S Despard Single Pole Switches . .	.66
3-Switch Boxes	.30	1-Switch Box	.10
COST List Price	$3.32	COST List Price	$2.04
● One device to a box is wasteful of space.		● The public is aware of the combination pace.	

EACH SUCCESSIVE P&S DEVELOPMENT HELPS YOUR BUSINESS

A P&S Development to Cope with *Today's Needs*

This is to be a great year in residential and commercial wiring . . . and with new requirements.

The demand today is for the modern—the call is for adequate wiring.

The P & S-Despard Line . . . fully developed and proved . . . modern as tomorrow . . . providing complete electrical convenience, meets every single need of the electrical contractor in coping with conditions . . . including the most important ones: PROFIT and SERVICE.

Typical of past and coming developments, the P & S-Despard Line promised to the electrical contractor a dependable specification line—flexible in service—and economical to install. It has surpassed its promise—old time wiring methods have been scrapped—new, modern materials are given preference today.

With the coming surge of building, the P & S-Despard Line will prove to be one of your greatest profit makers—every installation will be an advertisement for you!

We have prepared a booklet showing how the flexibility of the P & S-Despard Line meets today's demand. Write for your copy—now!

PASS & SEYMOUR, Inc.

SOLVAY STATION

Syracuse, N. Y.

ELECTRICAL CONTRACTING

Vol. 35 JULY, 1936 No. 9

▲

S. B. Williams, Editor

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FIELD BRIEFS

● SERVICE ENTRANCE cable was used throughout for the range wiring in a new all electric Boston apartment house.

● BECAUSE HE PUT PENNIES behind fuse plugs which had blown in his service station, R. B. Cobb, service station operator in San Diego, was fined $100 in police courts on charges of violating the electrical ordinance of that city.

● AT A COST of twelve millions annually New York State by grade crossing elimination could prevent 151 accidents a year while the same money spent for adequate lighting of main thoroughfares would prevent 10,000 accidents, D. M. Diggs, General Electric engineer, told the New York State Electrical Contractors Association at its Big Moose Convention.

● A SUCCESSFUL local association manager who keeps a large voluntary group of industrial contractors working harmoniously with him and among each other refuses to participate in the collection of dues. He maintains that the non-payment of local dues is an expression of members' disinterest, and any collection effort on the manager's part merely slows up more important business.

● A RECORD ELECTRICAL BID for a public project in the state of New York came to light when a low bid of approximately $1,350,000 by a group of non-union contractors was recently announced for equipping the Ward's Island sewage disposal plant.

● DID YOU KNOW that a large theatre lighting system would blaze in all it's glory for hours, although the main switchboard was more than 50 ft. under flood waters; or that 48 secondary clocks would continue to run for several days from storage batteries that were 2 ft. under water; or that a family could enjoy electrically toasted bread and electrically percolated coffee, all getting current through an ordinary residence meter, churning along in a water-filled basement? These things happened during the spring eastern floods.

● STATE REGULATION of electric utility rates now exists in forty-one states.

● A WIRING STANDARD for commercial buildings for use in new and old work, and similar in principle to Red Seal, is being drawn up by the Electric Service League of Toronto.

● TO INSURE future flexibility in its new million dollar warehouse addition at Portland, Ore., Montgomery Ward insisted it be wired in exposed conduit at a cost, it is reported, of approximately three times what it would cost to run the conduit concealed.

● STATE REGULATION of interior wiring is growing, according to the Uniform Ordinance Department of NEMA. Eleven states have such regulations with six of them providing for state licensing of contractors, six providing for inspection and two for sales control. Last year bills calling for state regulation were introduced in twenty-two state legislatures and this year three.

MASTER SPECIFICATION FILLS NEED

THE response by the architectural profession and the electrical industry to the Master Electrical Specification contained in the June issue of ELECTRICAL CONTRACTING is the strongest evidence one could have of the need that has existed for such a compilation. If the letters can be believed this Master Electrical Specification will have a direct effect upon a large volume of wiring specifications, and in that way will to a considerable degree help to improve the wiring adequacy of all classes of buildings.

Inadequacy of wiring in new buildings is due to many causes such as competition among contractors, lack of knowledge of what constitutes adequacy and the reasons therefor, insufficiency of appropriation and strangely enough the National Electrical Code. In some ways the last reason is perhaps primary because so many specifiers of wiring installations look upon the Code as an industry standard without any realization that it is a standard of minimums only. It is not understood for instance that the Code is a fire prevention standard and not a standard of utilization for the purpose of providing the best kind of service. For that reason when architects and others use it as a basis for specification writing, it is obvious that a minimum rather than an adequate job will result.

It all goes back then to an insufficiency of knowledge as to what constitutes an adequate wiring job. It has been no uncommon thing for buildings to be laid out with ample circuit and outlet provisions only to have the architect or owner call for new bids upon a reduced job in order that a certain appropriation be met. Would not enough money have been allocated for the electrical work in the beginning if the owner or architect realized the ramifications of an adequate job?

It is even doubtful if the electrical industry itself has had a proper conception of the scope of wiring adequacy. As load building programs are advanced, the public utilities begin to see the limitations of wiring, but as a rule only with respect to the particular program then under way. Electrical manufacturers have been slow to comprehend that wiring is virtually the bottle neck of the electrical market and, though they may not make wiring material, that the market is nevertheless definitely affected by the lack of adequacy.

Wiring adequacy in its relation to the progress of the electrical industry might be likened to the effect of good roads upon the growth of the automobile and gasoline industries. There is no question but what the building of 40-ft. roads, trunk highways, and the multiplicity of well paved connecting streets, bridges and tunnels have by providing more adequate driving facilities materially helped to increase the output of cars and gasoline. Wiring is the highway of the electrical industry. It must be ample. It must provide for future growth. When it is otherwise, we soon have a condition of congestion, unsatisfactory service and resistance to increased loads and increased demand for electrical utilization.

It is to improve this condition that the Master Electrical Specification was presented in the June issue of ELECTRICAL CONTRACTING. Some consulting engineers objected to the publication of the Master Specification on the grounds that it might take away work from them. It is more likely, however, that this Master Specification will have exactly the opposite result. By showing architects for the first time all of the elements that must be considered in the design of a satisfactory wiring installation and the engineering involved, as well as the thousand and one uses of electricity for which provision must be made, there are good reasons to believe that the architect will quickly sense the futility of trying to secure a satisfactory job for his client without the aid of a competent engineer.

Where architects will write their own specifications, the June issue of ELECTRICAL CONTRACTING will prove of tremendous assistance. The organization of the material and the manner in which it was presented have drawn many favorable comments from architects and engineers.

We have just received the June issue of the ELECTRICAL CONTRACTING magazine containing the Master Electrical Specification and Wiring Design, and hasten to congratulate you and your associates on this very comprehensive publication.

The Beltzhoover Electric Co.
Chas. M. Beltzhoover
Cincinnati, Ohio — President

✦

We wish to congratulate you on the June issue of ELECTRICAL CONTRACTING, containing Master Electrical Specifications and Wiring Design. We believe that these specifications will go far toward solving many of the problems of the electrical contractor.

Canadian Comstock Co.
A. D. Ross
Montreal, Canada — Manager

✦

Thank you for the June issue containing the Master Electrical Specifications. We are very glad to have this in our files. *Herbert Foltz & Son*
Indianapolis, Ind. — Architects

✦

The electrical specifications are perhaps the most difficult for the average architect's office, and from my casual inspection of the data which you have published and in the form in which you have published it, I will say that it will be received gratefully in most architects' offices.

I am personally grateful to you for it and appreciate your courtesy in sending it to me. *Philip A. Wilber*
Stillwater, Okla. — Architect

✦

This will acknowledge receipt of the June issue of ELECTRICAL CONTRACTING containing a Master Electrical Specification section. This should prove to be of valuable assistance to the architect, and I wish to thank you for your courtesy in sending me a copy.

C. D. Hasness
Harrisburg, Pa. — Architect

✦

The copy of ELECTRICAL CONTRACTING, containing a Master Electrical Specification section, has been read with great interest. We have decided to have

Completeness, simplicity and clarity were of major importance in the compilation of the Master Specification. Frequent cross checking within the text will serve to link up plans and specifications so as to reduce disagreements between the two. The sixteen pages of checking charts for different classes of occupancy will serve as reminders of service for which provision must be made and in that way materially lessen the number of omissions.

It is also interesting to note from the comments received that this Master Specification will be made available in several universities to architectural students. This is probably the first time that such students have had an opportunity to get a well rounded picture of the elements of good wiring practice. By thus impressing upon them the importance and ramifications of electrical work, the affects of this Master Specification should have an important bearing upon future work.

The publishers of ELECTRICAL CONTRACTING feel that in the Master Electrical Specification with its accompanying Design Procedure it has made a major contribution to the future development of the electrical industry, and it is particularly grateful to those who have expressed their opinion regarding this issue. Some of these comments are given here as indicative of the probable beneficial affect that this Master Electrical Specification will have upon the future trend of wiring toward a higher degree of adequacy.

Architects, engineers and contractors see June issue of *Electrical Contracting* as having marked effect upon future trend toward higher degree of adequate wiring.

this issue of your publication catalogued and placed on the shelves of the Architectural Enginering Library for current use by the architectural students. We appreciate very much your courtesy in sending it to us.

C. H. Cowgill
Professor of Architectural Engineering
Virginia Polytechnic Institute
Blacksburg, Va.

✦

Many thanks for yours of the 18th forwarding the June issue containing the Master Electrical Specification. I have glanced through the book and put it in our files for reference. I am sure it will prove valuable.

Voorhees Gmelin & Walker
New York, N. Y. *S. F. Voorhees*

✦

We wish to acknowledge receipt of your letter of June 15th, also the June issue of ELECTRICAL CONTRACTING which we find very interesting.

Albert Kahn, Inc.
Detroit, Mich. *J. G. Turnbull*

✦

I am writing you regarding the copy of ELECTRICAL CONTRACTING magazine you recently sent me, containing the Master Electrical Specifications, and I am surely pleased to receive it.

It is a good move to try and have every one connected with the electrical business use one master specification and avoid mistakes and errors of all kinds. *C. F. Bowdle*
Piqua, Ohio Architect

✦

This is to acknowledge the receipt of the June issue of ELECTRICAL CONTRACTING, which contains a Master Electrical Specification section.

I am sure that this will be of real practical value in connection with my office practice. Therefore, I will ask you to accept my sincere thanks.

Harry Barton
Greensboro, N. C. Architect

I find your developed electrical specifications and checking charts of great interest and I am sure that they will be quite helpful.

Federal Housing Administration
Miles L. Colean, Director
Washington, D. C. Technical Division

✦

I shall refer the copy of your journal to our librarian with the suggestion that she review it relative to its availability for our students in architecture.

Rexford Newcomb, Dean
University of Illinois
College of Fine and Applied Arts
Urbana, Ill.

✦

We have just been looking over the June edition of ELECTRICAL CONTRACTING and must congratulate you on the Master Electrical Specifications. They evidently represent a lot of thought and work and I am sure will be very much appreciated.

Motor Sales & Engineering Co., Inc.
Newark, N. J. *N. S. Dickinson*

✦

I wish to acknowledge receipt of the copy of ELECTRICAL CONTRACTING which contains the master electrical specification. This should be very useful.

S. H. Kress & Co.
New York, N. Y. *E. C. Sibbert*
Architect

✦

I am in receipt of the June issue of your periodical and fine it very interesting, not only the text, but the advertising as well.

The combining of electrical equipment items under one cover is a great help in an architect's office, as it eliminates the necessity of looking through a quantity of separate catalogues. *Prentice Sanger*
New York, N. Y. *Architect*

We are in receipt of the special number of your magazine, containing practically a manual of wiring. This is a very useful and comprehensive document and we are sure that it will be of the greatest value to us and to other architects, for the mass of information, its organization for the architect, and the specification form in which it is cast.

Stoughton & Stoughton
New York, N. Y. *N. H. Hunt*

✦

Want to thank you for forwarding your June issue of ELECTRICAL CONTRACTING which contains Master Electrical Specifications, and assure you of our hardy cooperation to standardize the building industry.

Chas. E. Firestone
Canton, Ohio Architect

✦

The copy of the June issue of ELECTRICAL CONTRACTING is herewith acknowledged and I believe will be a most useful source of information in the preparation of electrical specifications.

I appreciate having this source of information in the office files and know that it will be very often referred to.

It has certainly been set up in fine workable shape.

Fred F. Willson, A.I.A.
Bozeman, Mont. Architect

✦

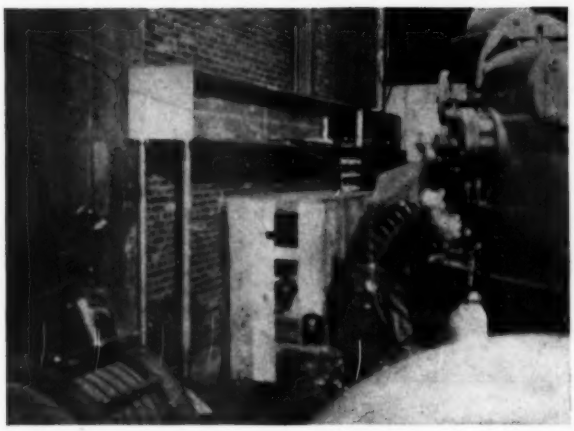
First of all let me congratulate your company for the efforts in organizing an issue as the June issue containing many valuable news for the contractor. After glancing through a few pages, I can't understand how anyone in the industry can be without this issue.

Winograd Electric Co.
New York, N. Y. *P. Winograd*

✦

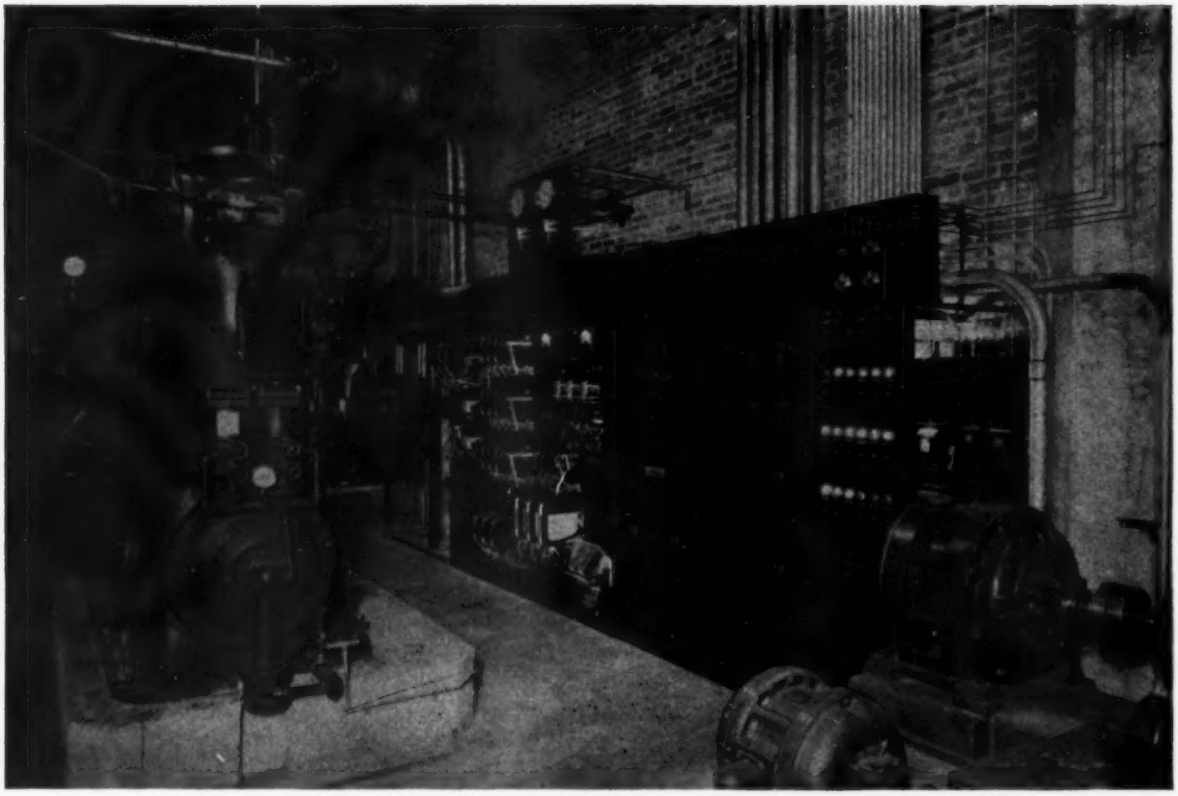
This will acknowledge with appreciation your kindness in sending us a copy of the June issue of ELECTRICAL CONTRACTING with Master Electrical Specifications therein. We are glad to place this in our specification files.

Morris and O'Connor
New York, N. Y. *R. B. O'Connor*

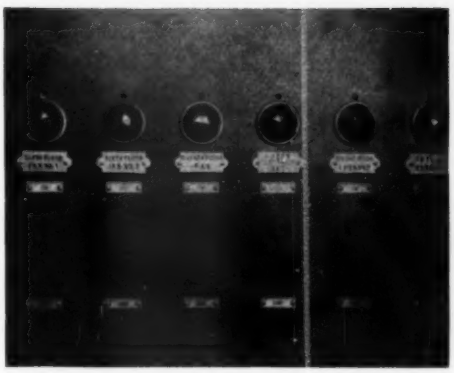


Before the new compressor machinery and pumps were set, a 22-ft. overhead pull-box that enclosed the new power feeders, was made ready for setting beneath it the various automatic controller panels as they came in.

Central Control of Scattered Air Conditioning Motors

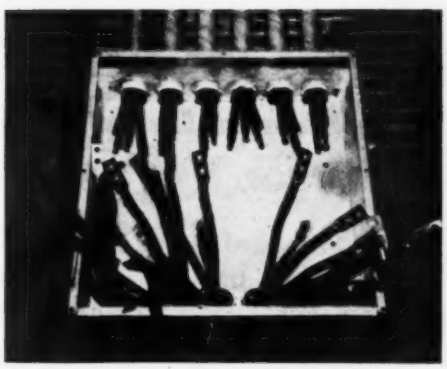


A steel panel at the right end of the centralized control board has remote controls for twenty-six auxiliary motors mounted on it. A steel door and blank fill-in plates had not yet been installed at the left end of the switchboard.



Each control station comprises a "start" and "stop" button; a ruby pilot that indicates when the motor is running; and an etched copper name plate.

By centralizing the air conditioning control equipment in the compressor room a multipled set of eighteen 500,000-c.m. cables in six 3-in. conduits effected important labor and material economies.



The auxiliary control circuits were routed to scattered motor locations on upper floors through a compact and inconspicuous gang of sixteen ¾-in. thinwall conduits arranged on double-deck trapeze hangers. Each raceway contained four No. 14 remote control conductors. A common connection to the neutral bus was used at the supervisory panel for all pilot lamps, thereby eliminating the need for installing five wires to each outlying motor controller location.

IN planning the wiring for thirty-one motors totalling about 750 hp. at Rich's, a large department store in Atlanta, Ga., a layout was made that permits control of various large compressor room motors and also the supervision of twenty-six scattered auxiliary motors at a centralized location. New air conditioning equipment was installed during remodeling operations that called for a completely revamped power system, plus the routing of power wiring to small air circulating fan motors on various floors. Because it was desirable to provide supervisory facilities near the main compressor units for all outlying auxiliaries of the new air conditioning plant, the Electrical Engineering & Repair Company of Atlanta installed one large motor control switchboard that incorporates the supervisory controls of twenty-six auxiliaries.

The central control scheme also offered an advantage in designing the additions to a crowded main switchboard. Instead of having to alter this equipment to accommodate several new sub-feeder panels, the principal motor additions were supplied by one new 2,500-amp. feeder breaker. Likewise the new feeder, which consisted of six multipled sets of three 500,000-c.m. cables, each in a 3-in. conduit, was routed through a crowded basement at less installation cost than would have been incurred if conduits of equivalent feeder capacity had been routed individually to scattered control centers. One set of trapeze racks and several large junction boxes accommodating the six conduits sufficed, whereas a scattered control layout would have necessitated considerably more hanger and pull-box materials.

The standardization of conduit bends and cuts for six 3-in. runs, and likewise the resultant uniformity in eighteen lengths of 500,000-c.m. feeder cable effected a saving in conduit and wire pulling labor.

By having fixed a central control board location in advance, the heavy feeder construction could be done before the new machinery and controller panels were delivered to the job. A full-length overhead pull-box was set up to accommodate automatic motor controllers for the 350 hp. synchronous compressor motor; a 125-hp. slip-ring compressor motor, and several smaller units. Below one end of the pull-box a supervisory remote-control panel for twenty-six small auxiliary motors was installed. When control equipment was set up the main feeders were already in place. This permitted placing a specific drive on break-in duty with little delay.

What Tools

*Should Repair Shop Mechanics Furnish?**

Suggested lists of tools to be furnished and paid for by different classes of mechanics in motor repair shops, compiled from a canvass of twenty shops in different parts of the country.

by J. E. Launder
Independent Electric Machine Company, Kansas City, Mo.

**Presented at Annual Convention N.I.S.A., Cincinnati, April 28, 1936.*

Electrical Machinists

1—Tool Box with Lock and Key
1—Tap Wrench—small tee handle
2—Pairs Calipers—8 in. inside and outside
3—Micrometers (0-1 in.) (1-2 in.) (2-3 in.)
1—Set Open End Wrenches up to 1 in.
2—Adjustable Wrenches 6-in. and 10-in.
1—Hermaphrodite Caliper 8-in.
1—Surface Gauge
1—Depth Gauge
1—Indicator (dial type)
1—Combination Square
3—Scales, 6-in., 24-in.
1—6-ft. Rule, Flexible Steel
3—Screw Drivers, very small, 6 in., 18 in.
1—Pipe Wrench 14-in.
1—Gas Pliers 6-in.
1—Scratch Awl
1—Set Thread Gauges
1—Drill Gauge
1—Air Gap Gauge, 12-in. Blades, .001, .002, .005, .008, .010, .012
1—Set Allen Set Screw Wrenches $\frac{3}{32}$ to $\frac{1}{2}$ in.
1—Set of 3-Angle Screw Drivers, 4-in., 6-in., 10-in.
2—Center Punches, small and large
2—Hammers: Ball Pein, large and small
3—Cold Chisels, $\frac{1}{4}$ in., $\frac{3}{8}$ in., 1 in.
2—Chisels for Grooving Bearings
2—Scrapers, small and large
1—Oil Stone—combination fine and coarse
1—Speed Indicator (revolution counter type)
1—Watch (not wrist type)
1—Pair Goggles (shatterproof type)

Outside Troublemen

1—Tool Box with Lock and Key
1—Flashlight
1—Set Air Gap Gauges
1—Speed Counter
1—Watch (not wrist type)
4—Screw Drivers, small—18-in.
1—Pair Tin Snips—12-in.
1—Knife
2—Hammers: 1 Straight Claw; 1 Ball Pein
1—Hack Saw
1—Pair Side Cutting Pliers 8-in.
1—Pair Long Nose Pliers 6-in.
1—Pair Gas Pliers
1—Pair Diagonal Cutters 6-in.
1—Set Socket Wrenches
1—Set Allen Wrenches $\frac{3}{32}$ to $\frac{1}{2}$-in.
2—Adjustable Wrenches 6-in., 12-in.
1—Pipe Wrench 14-in.
1—Blow Torch
1—6-ft. Rule Zig Zag (not metal)
1—Undercutting Saw
1—Pair Calipers 8-in.
1—Bearing Scraper
1—Center Punch
2—Chisels $\frac{1}{2}$-in.—1-in.
2—Wedges, Tapered Steel (to remove pulleys and gears)
1—Tap wrench, small tee handle
1—Drift
1—Test Lamp and Socket 220 V.
4—Files
1—Set Diggers (for cleaning shorts in commutators)
1—Pair Fuse Pullers 8 in.
1—Small Pinch Bar
1—Brace
1—Bag Assorted Nuts, Screws, Contact Parts, etc.

NOTE: Company will furnish hack saw blades, drills, files and such like tools as are perishable.

Utility Men

1—Hack-saw Frame
1—Claw Hammer (straight claw)
1—10-in. Crescent Wrench
1—8-in. Klein Side Cutting Plier
1—Pair Gas Pliers
1—Small Screw Driver
1—Large Screw Driver, 16 or 18-in.
1—Offset Screw Driver
1—Set, Socket Wrenches—$\frac{1}{4}$ to 1-in.
1—6-in. Steel Scale
1—6-ft. Zig Zag Knife
1—Large Pocket Knife
1—Large Drift Punch
1—Small Drift Punch
1—Center Punch
1—Cold Chisel
1—14-in. Pipe Wrench
1—Watch (not wrist type)
1—Tool Box with Lock and Key
1—Undercutting Saw
1—Set Diggers (for digging shorts out of commutators)
1—Test Lamp and Socket 220-V.
1—Oil Can

Winders

2—Screw Drivers 4 in., 8 in.
1—Pair Shears Heavy Duty (to cut insulation)
1—Pair Tinners Snips 10-in.
1—Knife
1—Ball Pein Hammer
1—Hack Saw
1—Pair Side Cutting Pliers 6-in.
1—Pair Long Nose Pliers 6-in.
1—Pair Bernard Pliers
1—Pair Gas Pliers
1—Pair Diagonal Pliers 6-in.
1—Set Socket Wrenches
2—Adjustable Wrenches 6-in., 10-in.
1—Pipe Wrench 14-in.
1—Blow Torch
1—Wire gauge
1—6-ft. Rule Flexible Steel
1—Undercutting Saw
1—Pair Dividers 8-in.
1—Micrometer 0-1-in. (for gauging insulation)
1—Pair Calipers
1—Wire Skinner
1—Bearing Scraper, small
2—Goose Necks
1—Probe
1—Center Punch
1—Set Allen Wrenches $\frac{3}{32}$ to $\frac{1}{2}$-in.
1—Insulation Cutter
2—Chisels $\frac{1}{2}$-in., $\frac{3}{8}$-in.
3—Tampers (metal)
2—Blunt Chisels
1—Test Lamp and Socket 220-V.
1—Set Feeders (fiber)
Fibers for Tamping
2—Raw Hide Mallets
1—Wedge Driver
1—Scratch Awl
1—Set Diggers (for digging shorts out of commutators)

Force Obsolescence!

By Samuel S. Vineberg
Manager
Electrical League of the Niagara Frontier, Buffalo, N. Y.

RE-WIRE America! That is the big job that confronts our industry today. What a marvelous opportunity for our contractors! What a marvelous opportunity for our wire, cable, conduit, supply and equipment manufacturers, jobbers et al.

The idea is excellent and should be carried out. It must be carried out. Why do we wait? Why not get started right away? The answer is "America does not want to be rewired." Perhaps, an isolated customer here and there wants to rewire, and will do it as soon as he can convince the bank to advance sufficient money on an F.H.A. insured loan. But by and large America doesn't want to be rewired.

Tenants in homes, offices, stores and factories are getting along today as they did in 1929. If they buy a piece of electrical equipment that needs extra wiring they can always call in somebody to do the job. But to rewire the whole structure for safety, convenience and appearances only—"why should we? Why should we ever ask the landlord, he will raise our rent. And besides, all similar buildings are as badly wired as this. Maybe if business picks up we will think about it. Maybe we will even build our own place."

This is just one picture. Hundreds could be drawn to illustrate why the "Re-Wire America" program will have to come out of the clouds and get down to facts. We must realize that although we as an industry appreciate what a fine thing it would be for us if we could embark upon a program to Re-Wire America, that "our patient doesn't even know he is sick."

True, we could advertise and like the Lambert Pharmaceutical Company make every building owner of home, store, office or factory believe he has halitosis. This is a conceivable job, complex and difficult though it may be. It could be done, but how much would it cost? Millions, because it is not the owners alone that must be impressed, it is the tenants too, and that means the great American Public.

Forced Obsolescence

We can approach this problem from another angle, on a much smaller scale and yet accomplish the job as rapidly as we as an industry can handle it, and at much less expense. That is through forced obsolescence.

How many people buy a new car because the old one costs too much to operate, yet it takes just simple arithmetic to prove that the average three year old car can be run another year for about half the annual cost of a new one. But the old car is obsolete, not because of its age but because a new model has come out which has many so-called refinements.

Wiring in a building isn't obsolete because of its age, but because refinements in wiring practice and equipment have occurred which make the old installations obsolete.

These old wiring jobs are obsolete. We of the electrical industry know they are. But our customers do not, and they don't believe us when we tell them.

If we had our new "models" running up and down the streets by the hundreds, and if each of our manufacturers spent several million dollars each year advertising the new models, which advertising by implication makes the older ones obsolete, then we too by comparison would have a comparatively simple job.

True we can't equal the automobile industry's job, nor do we want to but we can parallel it.

What we need is new models—real wiring installations that we can point to with pride, that we can get the public to look at and use as a criterion. The public will then without our assistance declare their own wiring jobs obsolete.

Can we get these show jobs, these models in old buildings that have been modernized? Does a modernized job in an old building look like a new model? How can it? The setting is against it. The public won't even bother to look at them. They are not interested in old models. But take them to a new home, store, office or factory, show them what a real modern wiring job is, then you are well on your way to close a sale.

Then the theory of forced obsolescence comes into operation. Inadequate, unsafe wiring jobs are in sharp contrast to the new wiring jobs. Owners and renters alike see and appreciate the difference. Then they realize their own wiring jobs are obsolete regardless of when they

were installed. Demand for modern, adequate, safe wiring appears, making old wiring jobs unwanted. Buildings with such installations are hard to rent or sell at normal prices.

Then and not until then, the owner must do something about it. This is the turning point. Consistent cooperative effort and promotion from this point on will keep the re-wiring business rolling.

Must We Be Re-Sold?

For years our industry has accumulated facts about the value of adequate wiring. Time and again it has shown that every outlet added to the wiring in a residence will add to the power company revenue from that home from $1.00 to $1.50 per year, which means more equipment and lamp sales, etc. Heavy duty outlets for ranges account for considerably more.

In localities where adequate wiring promotion has been engaged in, the average number of outlets installed in new homes has been increased by twenty and more outlets.

Must we be reminded of some of the excellent jobs done in the days of Red Seal promotion when the increased revenue from a Red Seal home in comparison to a similar non-Red Seal home was shown time and again to be from $20.00 to $24.00 per year, and the added value of equipment sold between $350.00 and $750.00 more than the non-Red Seal home?

Let us look back. The first Red Seal license in this country was issued to the Electric League of Syracuse in March 1925. According to figures compiled in Washington, 18 per cent of all homes now standing were constructed in the six years commencing with January 1925. If 75 per cent of those homes had been wired to the Red Seal standard, the added annual revenue to the power industry alone would be $66,000,000, or $11,000,000 of annual revenue added each year, while the added wiring and equipment sold would amount to one billion dollars in the six years, or over one hundred and sixty million dollars per year.

Didn't Have a Chance

The Red Seal program didn't have half a chance to succeed. Place the blame where you will, that is the truth. One thing is certain—it was sound and could accomplish all that is shown above. In Buffalo our Red Seal promotion did not get under way until January 1931. By the middle of 1932, we were having 44 per cent of all homes in this area wired to the Red Seal standard or better. By 1933 we expected to reach the 75 per cent point, but by August of 1932 the bottom dropped out of home construction, and only now appears to be showing a little life again.

The Red Seal Plan didn't have a chance. Change its name if you will and start all over. Fundamentally, it is sound if provided with adequate financial backing and man power.

Under normal conditions there are 750,000 homes (family units) built each year.

If a national Red Seal program is launched with proper financial backing, an efficient operation can make one third, or 250,000 homes, Red Seal in the first year, three-fifths, or four hundred and fifty thousand, Red Seal in the second year, and four-fifths, or six hundred thousand, Red Seal in the third year.

The actual cost of conducting a local Red Seal operation in any one locality will of course depend upon local conditions. It will vary from $15.00 to $20.00 per Red Seal home the first year, $12.00 to $17.50 the second year and $10.00 to $15.00 the third year and from then on.

Model Homes

Adequate wiring for new homes just like adequate wiring for old homes cannot be sold to the public by advertising alone. The public must be shown what adequate wiring is, and in a way that it can appreciate what it might mean. The show home plan is the most practical method of accomplishing this. Not only does this plan play into the hands of speculative builders and newspapers and win their support, but it draws thousands of residents in old homes who thereby become aware of "new model" wiring and forces obsolescence on old wiring jobs not up to standard. All moneys available for local newspaper advertising, if spent to put across show homes, should return the greatest benefit both for adequate wiring in new homes and re-wiring of old homes. Direct mail, billboards, etc. also have their part in the picture, particularly in keeping the speculative builders, architects and electricians sold. If money is raised nationally it could be spent in national publications where the reader has more leisure to read about the value of adequate wiring.

Wiring Should Lead

Just as the promotion of adequate wiring is the key to the re-wiring of the old home, so the whole adequate wiring program should be the starting point for all other promotions. Electric kitchen promotion, housewares program and Better-Light-Better Sight program all can be a vital part of the adequate wiring program, and would of course gain tremendously as a result of a series of show homes conducted in every city, town and village.

Nothing was ever accomplished without enthusiasm. Slogans are a poor substitute. What we need is the courage of our convictions. If we mean to Re-Wire America, let us start and follow a planned course, always keeping our heads up and our eyes on the objective ahead.

Put gas in the tank, clear the tracks and throw her in gear! Let's get going!

Force Obsolescence!

Automatic Starter Control Combinations

By N. D. Buehling
Industrial Engineer, Allen-Bradley Co., Milwaukee, Wis.

THE automatic starter is an extremely versatile device. It can be used with simple push buttons to start, stop, and protect a motor, or with the aid of a few standard control devices it can be connected so as to automatically provide almost any complex control sequence desired.

There are many different types of control switches, or pilot control stations as they are termed, for actuating an automatic starting switch and controlling a motor. The most commonly used is the push button, which may be of either the momentary or the maintained-contact type. The former are most frequently used in the control of motor starters.

In addition there are many different kinds of automatic control switches such as automatic pressure switches, float switches and thermostats. When it is desired to change from manual control to automatic control, a selector switch is often used in conjunction with a push-button station and an automatic switch. This selector switch has three position: One connects the starter to a push button, another to an automatic control device, and the third disconnects the starter completely.

As a rule 2-wire pilot controls are desirable wherever motors have to be kept running regardless of momentary voltage failures, or where motors and machines are so located that their unexpected starting cannot cause any damage or endanger life. However, since the 2-wire contact does not provide no-voltage protection, 3-wire pilot controls should be used on all machines where unexpected starting of the motors creates a condition that might be dangerous to workers.

It is also important to remember that with 2-wire control devices, manually reset overload relays must be used, in order to prevent "cycling" of the equipment. If automatically reset relays were used with 2-wire control, as soon as the overload relays cooled and automatically reset after having tripped, the circuit to the motor would be re-established. Then the motor would start again, and the existing overload would again trip the relays, open the starter, and stop the motor. This cycling would continue until the motor had burned out.

With the diagrams on the next two pages this article gives a simple explanation of the varied possibilities of automatic starters when used with standard control devices.

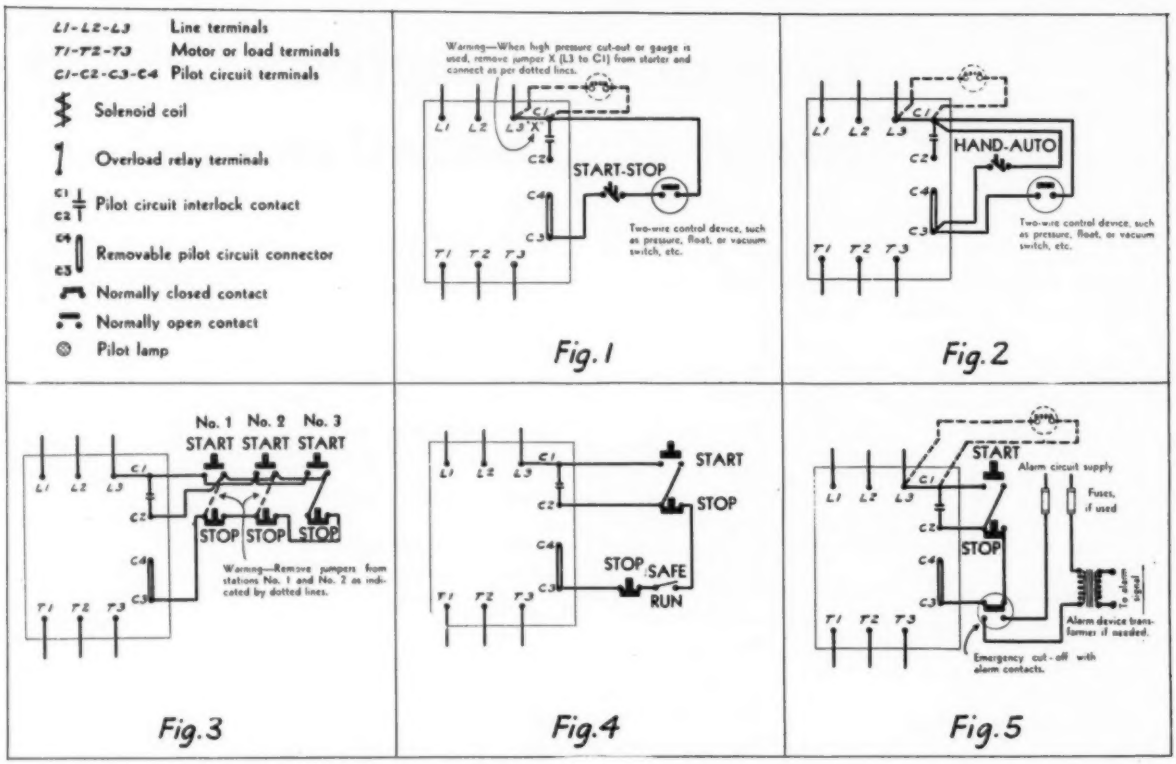
The 2-wire maintained-contact manual switch and the 2-wire automatic switch can be connected in series to actuate one starter, as shown in Fig. 1. In the "auto" position of the manual switch, the starter would be automatically operated, while in the "off" position, the starter would be disconnected, regardless of the position of the automatic switch. The only function of the manual switch, therefore, is to open the starter and disconnect the motor from the line. The same function would be performed by a disconnect switch at the starter, but here there is the advantage of remote control.

Another combination of the maintained contact manual switch and an automatic switch is shown in Fig. 2. Here the two control switches are connected in parallel. With the manual switch in its open position, the control will be entirely automatic; with the manual switch in its closed position, the starter will always be connected, regardless of the position of the automatic switch. The method of connection is sometimes used in the control of refrigerating compressors—the manual switch being used when it is desired to get temperatures or pressures other than those corresponding to the setting of the thermostat or the pressure switch.

The method of controlling automatic starters, that is most frequently used is by means of the 3-wire "start-stop" push button. Like the 2-wire manual control switch, it is used to control motors from remote points, but it possesses an additional advantage in providing no-voltage or low-voltage protection. Once the starter is opened, the "start" button has to be pressed again in order to restart the motor.

Any number of 3-wire "start-stop" push buttons can be connected, as in Fig. 3, to actuate one starter and control one motor. Pressing any one "start" button will start the motor. Pressing any one "stop" button will stop the motor. Suppose a worker had to be at a number of locations during various periods, yet stop and start the motor at intervals. Connecting a number of push buttons in this way at different points would make it possible for him to control the motor from any one of these locations.

In machines of great length, such as conveyors and similar equipment, it is often necessary or convenient to stop the motor from different parts of the machine, although it may not be necessary to start them again from these points. In such cases, the arrangement shown in Fig. 4 is used. This diagram shows both a monetary-contact "stop" button and a maintained-contact "safe-run" switch. The "stop" button will stop the motor when it is pressed, but will permit re-starting only from the "start-stop" station. The "safe-run" switch, like the switch shown in Fig. 1, acts as a remotely controlled disconnect switch and permits the worker to repair or adjust a machine



without fear that it will be suddenly started from the pilot control station. Any number of "stop" buttons or "safe-run" switches can be connected in series and located at different spots.

It is sometimes desirable to provide an emergency cut-out with automatic starters which are manually controlled by "start-stop" push buttons, to disconnect the motor in case a dangerous condition occurs. Fig. 5 shows a magnetic switch controlled by a "start-stop" push button and protected by means of an emergency cut-off. This particular installation is also provided with an alarm circuit, which is closed when the emergency cut-out opens.

Automatic 2-wire control devices, too, are often provided with automatic cut-outs, adjusted to open above the normal operating value of the automatic control switch to shut down the motor in case the automatic switch should fail. Alarm contacts can also be provided if desired.

Up to the present, we have only discussed control systems in which the starter has continued to run after the finger has been removed from the "start" button. It is sometimes desirable to be able to control the motor travel more closely. For example: On any machine where it is necessary to run the apparatus up to a certain point and stop it, "inching" control of the motor is necessary. When a control station provides inching control, the "inch" button starts and stops the motor. When the button is depressed the motor runs, but when the button is released the motor stops. Thus, by touching the control button momentarily, the machine can be moved an inch or two at a time.

Inching control

A "start-stop-inch-run" control station, consisting of ordinary "start-stop" push buttons combined with a two-way selector switch is shown connected to an automatic starter in Fig. 6. Throwing the selector switch to the "run" side permits the station to operate as an ordinary "start-stop" station. However, if the selector switch is thrown to the "inch" side, the motor will only run when the finger is kept down on the "start" button—permitting inching of the machine.

Another method of obtaining inching is shown in Fig. 7. This method utilizes a three-button "start-inch-stop" station. The "start" and the "stop" buttons operate in the regular manner, and the "inch" button starts the machine when this button is depressed and stops it when the finger is removed. This arrangement possesses advantage over the control just described in that inching can be obtained directly without first throwing a selector switch. On the other hand, there is the danger that the "start" button may be pressed instead of the "inch" button, and the machine will not stop when the finger is removed, as is expected. Unless the button has been designed for this operation and has a long travel, the starter may remain locked in when the finger is quickly released from the "inch" button.

It is sometimes desired to control a machine automatically during certain periods and manually at others. This can readily be done by connecting both the manual and the automatic control switch in the circuit, as in Fig. 8, and selecting the desired one by means of a three-way selector switch. When the three-way selector switch is connected in the "auto" position, the "hand" position is dead and the starter is controlled by the pressure switch, float switch, vacuum switch, or thermostat. When the selector switch is in the "hand" position, the automatic

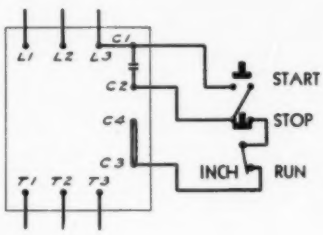


Fig. 6

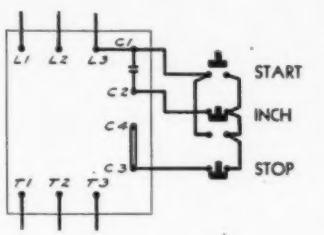


Fig. 7

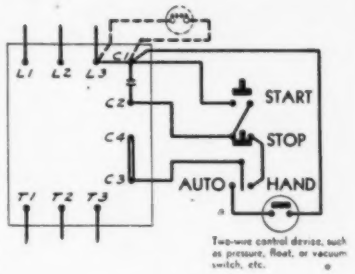


Fig. 8

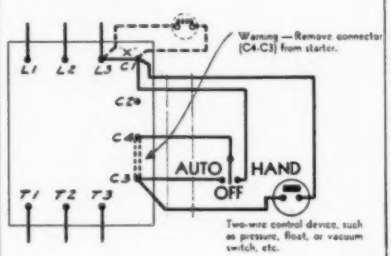


Fig. 9

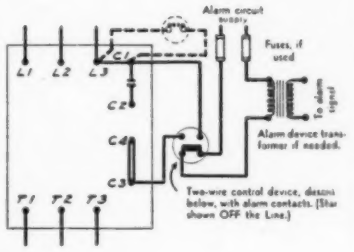


Fig. 10

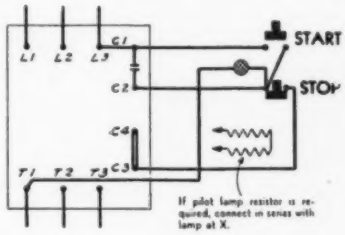


Fig. 11

pilot control device is inoperative and the starter works just as if it were connected only to the "start-stop" push buton. When the selector switch is in the "off" position, the control circuit is open and the motor cannot be started. This arrangement is comparatively rare and is used when both hand and automatic control are desired, but where the hand control must be of the three-wire type to provide no-voltage protection.

The diagram in Fig. 9 shows a somewhat similar but simpler circuit. The automatic starter is equipped with a three-way selector switch and a 2-wire control device. When the selector switch is in the "auto" position, the 2-wire control switch operates the starter. When the selector switch is in the "off" position, the starter is open, and when the selector switch is in the "hand" position, the starter is closed. This diagram is, therefore, exactly the same as that shown in Fig. 8, except that the "off" and "hand" positions of the selector switch replace the push-button station, and the push-button station is not required.

The above description covers the more simple combinations of push buttons, selector switches, and automatic control devices. In addition to the simple automatic starter which is to be used with an external or separate pilot switch, most control manufacturers offer automatic starters with built-in control switches. These starters are identical to the simple starter, except that in one a "start-stop" push button is built into the cover of the enclosing cabinet. Another form has a three-way selector switch built into the enclosing cabinet. These special starters often simplify mounting and wiring and are more compact than the separate units.

Combinations

There are a number of standard devices which can be used in combination with automatic starters and which offer useful protection or convenience. One of these is the automatic alarm signal illustrated in Fig. 5. Such an alarm is usually used in conjunction with a 2-wire automatic control device or emergency cut-out, as in Fig. 10, to indicate when the operator should give his attention to the machine.

A red pilot lamp is sometimes connected across the line through the holding contacts of the starter to indicate whether or not the starting switch is closed. This pilot light may be mounted on the push button or in any convenient location. Sometimes a resistor is required in series with the pilot lamp to reduce the voltage across the lamp. Fig. 11 shows the application of the pilot light to a starter controlled by a push-button station.

In some manufacturing processes it is very important that there be no interruption in the operation of the driving motor. Where the machine is served by an automatic starter operated through a "start-stop" push-button station, motor shutdowns due to momentary voltage dips and switch-overs to another source of power can be avoided by using a time delay push-button station. These stations consist of a "start-stop" push button mechanism and a timing relay. After the "start" button has been pushed, the contacts of the timing relay will maintain the lock-in circuit for any period up to 3 sec., whereupon the control circuit is opened. If the voltage dip is of less than 3 sec. duration, the motor is not disconnected.

The control combinations discussed in this article are but a few of the many that are possible with the standard parts available today.

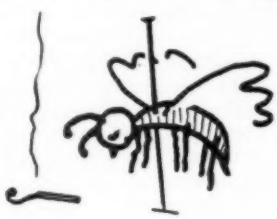
The fire bug panel flanked by good and bad practices.

Electrical Fire Bugs on Display

A NEW approach to public education on faulty residential wiring was used by the Electrical Contractors Division of the Cincinnati Electrical Association in its display at the Fourth Annual Electrical Progress Exposition. In creating this display the contractors had the cooperation of the Union Gas & Electric Company. In order to bring home to the public the necessity for safe wiring in contrast to parallel examples of faulty wiring, the central panel of the exhibit contained a number of so-called fire bugs. These fire bugs were the actual pieces of electrical wiring materials that had caused fires and which had been removed by inspectors of the Ohio Inspection Bureau. Each of these fire bugs was labelled with its history.

It is estimated that 25,000 people viewed the contractors' exhibit during the week of the exposition. It was held over for the following week as a feature of the Better Vision section of the exposition when about 3,000 more persons saw the display.

Each visitor to the contractors' exhibit was given a small folder which offered free wiring estimates by the Association. The inside pages of this folder stressed the need for wiring improvement in many homes that were originally wired mainly for lights. Six suggested items of customer-use wiring convenience were pointed out.



This display is reported to have brought about closer cooperation between the municipality, the inspection bureau, and the Contractors' Division of the Cincinnati Electrical Association. An outgrowth of this educational activity is a recent meeting between the inspection bureau and the members of the fire marshal's staff, which was called by the fire chief. This meeting was held to encourage a wider acquaintance with various types of faulty wiring in connection with routing fire hazard inspection work.

This display attracted so much public interest that it has since been used in Middletown, O., at the City Hall in Cincinnati, and will continue on display at various parts of the city, including the power company.

A City Organized for Adequate Wiring

WITH proper inspection and a better appreciation of Code rules as a foundation, the electrical industry of Louisville, Ky., has gradually built up an inter-related industry organization set-up without central guidance, the primary purpose of which is to secure adequate wiring. It is providing the public with well engineered plans and specifications, is eliminating the extras caused by poorly drawn specifications by means of an Approval Bureau that guarantees the public that it will get what it asked for, is reducing the amount of dangerous and defective wiring through reinspections. It has provided a forum for the open discussion of best practices, encouraging attendance by workmen, has built up a spirit of friendly rivalry in well done work, has provided a place where new developments and products can be explained to the contractors and their men, has materially reduced bootlegging and has provided an efficient inspection service not only for the city but for the suburbs.

All this is now being accomplished through cooperation and without any central direction and without any expensive dues set-up. It has been an evolution that started back in 1912 with the Electrical Clearing House. Today there are ten or more separate agencies or associations of a voluntary nature the work of which dovetails together in giving to Louisville good workmanship, good competition and adequate wiring.

Electrical Clearing House

The first of the organizations, the Electrical Clearing House of Louisville, Inc., has performed a worthwhile service for nearly a quarter of a century. Here, the contractor has since 1912 met the inspector on common ground in regular open forum meetings to discuss and interpret the National Electrical Code. Workmen, manufacturers' representatives, wholesalers, power company engineers, and others are welcome guests, because all have an interest in the Code rules as they may affect their work or their products.

The periodic changes in the Code rules have always been carefully reviewed and argued through at these meetings with the result that those in attendance acquire a useful fund of practical information to guide their work, whether to inspect, to design, or to install wiring and equipment.

Another worthwhile function of the Clearing House has been to invite specialists to appear before its members to explain new products, to discuss new problems of the contracting industry, or to present other matters of interest to such a gathering.

It is regular procedure at these meetings to hear reports from electrical inspectors and complaints as to Code or ordinance violations, questions of procedure or of unusual conditions. These meetings have in turn caused the inspectors to take a live interest in their duties. As a result, perhaps, of this continuous contact, the Louisville inspectors have for over two years been conducting reinspection work despite a limited staff. Much of this reinspection work has been carried on voluntarily outside of regular working hours, after the regular daily routine of new inspection calls was completed. Bootleg or unauthorized wiring is kept more closely under control because of the Clearing House. With inspectors attending all its regular meetings, the contractors and workmen alike are being reminded to cooperate in reporting such activities promptly. Because of this close cooperation, no one hesitates to inquire at the office when in the least doubtful whether a permit has been taken out for a particular job.

Suburban Inspection

With interest in inspection matters so manifest, a private county inspection service was established. This work was taken up by an experienced man who had worked in the territory for an insurance rating organization. Because of the close contact that existed in the Clearing House among power company engineers and those sponsoring suburban inspections, this new inspection agency was accepted by the company as its recognized clearing authority. All county work is therefore inspected for its safety and for its compliance with the Code before service connections are made.

Policing Super-Standards

With enforcement of the minimum Code requirements already well organized by city and county inspectors, the next step was to provide a means to guarantee the public that jobs planned to provide higher than Code standards would be installed exactly as specified. This gave rise to the Kentucky Electrical Inspection Bureau, a private organization that represents the owner or his agents as the job inspector from start to finish. Raceway sizes, wires and cables, and all other items of electrical material or equipment are inspected and measured to guarantee that they are of the make, quality and size that have been specified.

KENTUCKY ELECTRICAL INSPECTION BUREAU

Certificate No. _____ CERTIFICATE OF APPROVAL

This Certifies that the electric wiring and apparatus in the premises _____ and

Located _____

comprising _____ circuits _____ fixtures _____ drops _____

installed by _____ has this _____

day of _____ 19__ been inspected and approved by this bureau.

The undersigned further certifies that the above noted equipment has been installed in accordance with the rules and requirements of the National Electrical Code.

It is a condition of this certificate that no additions or alterations shall be made in the above system of wires or appliances for conducting, creating or controlling the electric current in this building, without first notifying this Bureau the right of re-inspection at any reasonable time being hereby reserved.

ELECTRICAL INSPECTOR.

Certificate of approval

When an insurance rating bureau reduced its electrical inspection staff during the depression, this private owner-inspection service was begun as an experimental venture. The merit of such a plan was recognized by many contractors, as a sure way to curb cheating on jobs. It eliminated the substitution of second-hand or cheaper products, it stopped the alteration of good layouts to cut costs, and it exposed the substitution of lower raceway or cable sizes than called for. Some projects were signed up for this new service, but not enough general use was made of it to make it self-sustaining until another allied service was added to the local plan, a central layout service.

Layout Service

A private corporation was therefore set up to prepare electrical layouts and specifications, known as Ray W. Chanaberry, Inc., and headed by a former engineer-inspector of an insurance rating and inspection bureau. Mr. Chanaberry formed the original private inspection agency previously mentioned and when its usefulness had been demonstrated, severed his connections with it to devote full time to the new plan and specification engineering organization. Because this agency specializes in electrical engineering work and does no contracting, the larger contractors have refrained from making layouts or writing specifications. With a central organization set up to specialize and to plan the wiring for all types of new and old structures, the contractors found many more jobs clearly laid out for preparing bids than ever before. Less confusion to owners and among competing contractors resulted. The quantity and quality of wiring was found to be considerably increased under this layout service. When an owner could discuss the merits of his wiring installation with a non-bidding engineer, he was found to be more open-minded to suggestions. Likewise, once an adequate layout was prepared it seldom needed to be modified to meet competitive destructionists.

One of the important services performed by this private layout organization is for alterations in the hazardous locations that are to be found in Louisville's distilleries, breweries, grain-handling plants and other industries. Since this type of work requires a great deal of detailed consideration, an unplanned job often resulted in considerable confusion and misunderstanding before all electrical bids could be fairly and correctly compared.

Because the preparation of special job layouts and specifications and their final inspection go hand in hand, this planning service established the inspection organization as a permanent independent function. As operating today, the owner and electrical contractor look upon each service as necessary functions.

It is reported that some contractors are not completely in accord with this set up. Because the members of certain contracting organizations are designing engineers, this centralized layout service removes to a degree some of their competitive advantage or influence with owners or architects on complicated and indefinite jobs. Some engineer-architects likewise consider this centralized layout service to be an encroachment on their work. However, the fact that this service continues its functions on a purely voluntary acceptance basis by the electrical contractors has resulted in electrical layouts amounting to about $900,000 being completed during the six months ending Feb. 29, 1936. A peak staff of eight engineers was employed in doing this work.

Regardless of some disagreement with this central planning service, several well-known electrical contractors have expressed satisfaction at being relieved of rendering expensive free layout service. Having made voluntary decisions to support it, the contractor can recommend that owners or architects consult its engineering staff.

Quantity Surveys

The central planning agency also prepares when requested quantity surveys covering labor, materials or both, for electrical contractors. Estimating charges are divided pro-rata among the subscribers. These charges are based upon the actual take-off time that is required, plus the cost for editing and preparation of quantity sheets, and all incidental supplies.

LOUISVILLE'S COOPERATIVE ORGANIZATIONS	FUNCTIONS
Electrical Clearing House	Code and product discussions
Municipal Electrical Inspectors	City ordinance enforcement, reinspections
State Inspection Bureau	Suburban inspections
Kentucky Electl. Inspection Bureau	Owner-protective private job inspections
Electrical Contractors Assn. (union)	Represented in Clearing House and League
Master Electricians Assn. (non-union)	Represented in Clearing House and League
Labor Representatives (not restricted)	Attend Clearing House meetings
Ray W. Chanaberry, Inc.	Private corporation operating central job layout and estimating service
Kentucky Actuarial Bureau	Cooperates to secure low insurance rates
State Fire Marshal	Deputizes city inspector for electrical decisions
Louisville Gas & Electric Co.	Represented in Clearing House and League
Electric League of Louisville	Commercial coordination by delegates from nine industry divisions

Maintenance Engineering

Supplementing the centralized layout service, this private agency has made considerable inroads in another field. Industrial plants and commercial properties are inspected at quarterly periods for evidences of obsolescence or hazard. This service includes the preparation of plans and specifications or written reports that enable an owner to engage his electrical contractor or motor service shop to make the necessary changes or repairs to an electrical installation.

Labor Efficiency

Because the Clearing House meetings are open to electrical workers, the rank and file are able to learn about Code matters and product developments. These meetings are attended quite regularly by officials of the electrical workers' union and by non-affiliated workmen. The information gathered during discussions at such meetings can thus be taken back to others. As a result, individual workmen are quite thorough in Code matters and in improved installation methods. This tends to promote greater efficiency, and to eliminate costly errors of judgment.

The Power Company

For some years past engineers connected with the local power company have taken an active part in the Clearing House. Because of their presence at regular meetings the gradual evolution in local service equipment installation requirements were made clear to all contractors with minimum confusion or misunderstanding. Better workmanship was encouraged by a courtesy arrangement wherein the power company had photographs made without cost to the contractor of all exceptionally neat and adequately planned service equipments. Since this feature placed the contractor and his men responsible for care and neatness of installations, a definite encouragement was given to higher standards of workmanship.

The League

The varied commercial interests of Louisville meet on common ground through its electrical league. Here the manufacturer, wholesaler, two contractor associations, dealer groups, inspectors, the power company, the telephone company, electrical engineers, and others, may conduct through their representatives such business as extends beyond the scope of the Clearing House.

A Voluntary Plan

Without centralized direction Louisville has experienced a healthy growth in cooperative business-building, through a federation of organizations which promotes wiring adequacy, which squelches unethical practices, and which speeds the acceptance of progressive trends. There are no "musts," rather a logical procedure of various industry groups working side by side in the interest of better and larger use of electricity.

Modernistic lines in a remodelled hotel lounge.

Lumiline

Applied to Hotel Modernization

HIGH ceilings in the Ansley Hotel lounge at Atlanta, Ga., were recently furred to conceal architectural embellishments dating back to earlier days, thus permitting the installation of new lumiline and urn lighting effects to accentuate modernisms in hotel remodeling. The six columns in this 42-ft. by 80-ft. area were also furred with pressboard materials, thus simplifying the concealment of new column outlets and their branch circuits.

A total of 32 5-lamp polished chromium lumiline units were installed, made up of five 18-in. long 30-watt section, totalling 4800 watts and employing twelve branch circuits. The four sides of each column had a lumiline unit, and a 60-watt urn directly above. Similar units were provided around the walls in symmetry with the column rows. The thirty-four urns, totalling 2040 watts, were controlled from six circuits, and were located 6 ft. below the 22-ft. beamed ceiling.

"Surprise pink" lumiline lamps on polished chromium strips, and amber 60-watt urn lamps were selected because of the decorative scheme employed. The ceilings were given a golden-yellow tinted field supplemented with red and silver bands for lineation. The sidewalls were of peach color, and the columns in gold and yellow.

Concealed wiring connections were provided for the lumiline units with outlet boxes that were set flush with openings in the pressboard furring panels. These outlet boxes were completely covered by the bases of the lumiline units. Wires which inter-connected the five 30-watt lumiline lamp sections were brought out of the back of the unit through a bushing and spliced to the circuit conductors in the outlet box.

"GYP" MOTOR FACTS

"Responsible service shop operators can do nothing better than pledge themselves to have nothing to do with 'gyp' motors,"

says William C. Krauth of Louisville, Ky.

THIS statement is based on many years' experience in selling and repairing motors, and in the operation of a large supply depot for small motor parts. Mr. Krauth contends the sale of "gyp" motors can undermine an otherwise good reputation for a motor service shop.

When a competitive line of motors was offered the Wm. C. Krauth Electric Company some time ago at an attractive price, Mr. Krauth decided to make some tests. If these "just-as-good-but-cheaper" motors were to be offered to his trade he resolved to make sure of their actual performance. A ½-hp. "gyp" motor, which he chooses to call brand No. 1, was put to a series of tests alongside two other makes. These he calls motors No. 2 and No. 3. Lever brake tests were run on all three motors under exactly the same conditions to compare their locked-rotor torques; locked-rotor, current consumption; idling current consumption; and full load speed performance. The test readings were as follows:

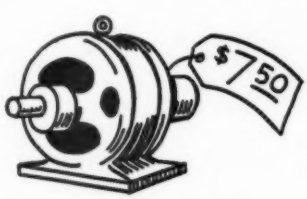
	Locked Rotor		No Load	
Motor	Torque	Current	Current	Speed
No. 1	3 lbs.	13.5 amp.	3.2 amp.	1625 rpm
No. 2	5.5 lbs.	13.5 amp.	3.1 amp.	1760 rpm
No. 3	5.75 lbs.	13.5 amp.	4.2 amp.	1700 rpm

These tests indicated that "gyp" motor (No. 1) delivered only 55 percent the locked-rotor torque of motor No. 2, and only 52 percent that of motor No. 3. Its no-load current consumption, however, was more than that of motor No. 2. The full load speed was only about 92 percent of motor No. 2, and about 96 percent of motor No. 3. Therefore, while consuming the same amount of locked-rotor current as motor No. 2, yet delivering only 55 percent torque or work, it also slowed down when pulling its full load to about 92 percent the speed of motor No. 2.

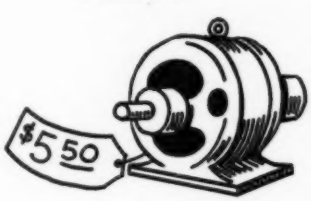
Needless to state, the "gyp" line of motors was not accepted.

Some makes of cheap motors in Mr. Krauth's experience consume their cost in wasted current, or one year's excess current consumption often amounts to more than the saving in cost. The production loss because of under-speed operation, such as in pumps, grinders and other machines is still an additional cost factor that can only be computed from detailed time or motion studies.

The quality motor dealer must appreciate and encourage the power company's interest in motor starting characteristics. While their interest is mainly to prevent high-inrush from causing annoying light flicker or fluctuation, they are also becoming interested in helping the customer get the maximum work in motor horsepower for each unit of consumed energy. Therefore, a cheap motor that is only 90 percent efficient and often less, in comparison with a quality product, represents a loss rather than a saving to their uninformed customers.



How long before the customer will use up this apparent saving in wasted current?

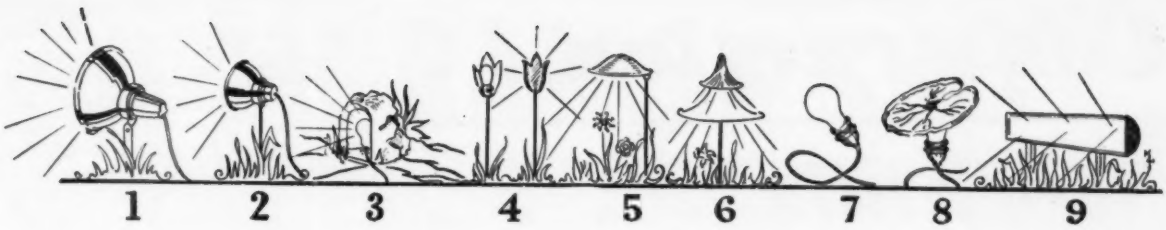


Mr. Krauth reiterates his opening statement by saying that many motor dealers are guilty of tearing down NEMA motor standards. He refers to the bargain-hunting purchasers of "gyp" motors. A truckload of distress motors is brought to the door, picked over—and paid for in cash. The quality motor manufacturer, however, is pressed for liberal terms of payment.

Shop operators cannot afford to assume an attitude as was recently expressed to Mr. Krauth by a machinery salesman. When the machine's cheap motors were discussed he said, "I don't have to pay the power bill." Records were produced where one of this salesman's customers paid $7.00 per month more for current, amounting to the consumption of 25 percent more energy, than to operate another identical machine in the same customer's plant. A standard quality ½-hp. motor was on the efficiently-motored unit.

Because the public expects a motor service shop to sell dependable goods, the shop operator must be fortified with more performance facts, and less trade-name sales talk. Those dealers who sell motor parts and also do repair work must be alert to learn the common weaknesses of cheap motor construction. If "gyp" motors sell for less, there are also certain faults of construction, deficiencies in performance, and short-lived moving parts that make them more expensive to operate than any ordinary saving would justify.

For fifteen years the Wm. C. Krauth Electric Company has kept records of service shop cost data, ranging from ½-hp. to 200-hp. motors. While this information was being accumulated the employees have compiled all possible information from buyers of motor parts. From the statements of maintenance men, much has been learned that has dictated the type and quality of motors and replacement parts that should be sold by the responsible motor service shop. Quality products can't spoil a good business reputation, says Wm. C. Krauth, and when plain sensible facts are produced, reliable motors can be sold in the face of "gyp" competition.



SPECIFICATIONS

FOR

Garden Lighting

by Dean M. Warren

General Electric Company
Nela Park Engineering Dept.
Cleveland, Ohio

GENERAL illumination should be provided over the garden. It serves as a background for the development of points of interest and eliminates objectionable contrasts.

Because gardens are usually so located that there is very little competing brightness, care should be taken to avoid excessive values of general illumination. Once the general illumination is provided it is a simple matter to pick out the garden beauties as they appear throughout the year and accentuate their color, form and texture by intelligent use of supplementary lighting.

Here is a summary of equipments for different parts of the garden, with general comments on their application.

Garden Location	Equipment and Wattage	Approximate Coverage	Comments
General Lighting	No. 1. 100-200 watts No. 6. 60-180 watts No. 9. 80-120 watts	Small Garden (100 watts) Medium Garden (At least 200 watts) Large Garden (300 watts or more)	Reflectors mounted high and directed at an angle are preferable. A large tree, a house gable, or bird house is a good location. Such lighting should be shielded.
Flowering Borders and Hedges	No. 4. 6 or 10 watts No. 5. 40-60 watts No. 9. 80-120 watts	10-15 lineal feet where a set of seven is used. 6-8 ft. circle 6-8 lineal feet	For the low borders, use border or floral shields in order that lamps may be completely shielded from view of observers. Where borders are high and afford concealment, units such as No. 5 may sometimes be used. Trough reflector may be located on ground along border or hedge.
Steps and Paths	No. 3. 10-40 watts No. 5. 40-60 watts No. 6. 60-180 watts	4-6 ft. circle 6-8 ft. circle 10-15 ft. circle	Wherever rocks will blend with surroundings, such as in rock gardens, a rock with a space hollowed for a lamp is useful. A versatile unit that may be concealed in shrubs or hedges, near paths or at steps. Where a touch of color is required, in addition to the utilitarian lighting, this unit may be used.
Flower Beds	No. 4. 6 or 10 watts No. 5. 40-60 watts No. 6. 60-180 watts	Each unit covers a small area 6-8 ft. circle 10-15 ft. circle	Border or floral shields are particularly useful for emphasizing the more beautiful blooms. They should be used where the lamps are completely shielded from view. The wiring permits placing the units at random in the bed. A most satisfactory way to conceal a light source. It may usually be located so as to be inconspicuous in the daytime. Where a more ornamental unit is desired such as in the center of a flower bed, this may be used.
Rock Gardens	No. 2. 25-40-60 watts No. 3. 10-40 watts	6-8 ft. 4-6 ft.	Small reflectors may be concealed by rocks and planting. A good unit because it accommodates this service.
Pools	No. 7. 10-100 watts No. 8. 40-60 watts	2 to 4 watts per sq. ft. of water surface (clear water) 2 watts per sq. ft. of water surface	Best effect results are obtained when the bottom and walls of the pool are painted a light color, such as turquoise blue. Bare lamps may be concealed under overhanging ledges, behind rocks etc. The lamp and socket may be held in position by weight on the rubber cord, a stone or brick. A rock or brick may be used as a weight to keep the floating metal lily pad in a fixed position.
Small Jets and Fountains (Submerged Lighting)	No. 7. 10-100 watts No. 2. 25-40-60 watts	Single jet 15-25 watts per ft. of height	Lamps may be submerged in water near jet. The agitation on the waters helps to conceal lamp. Small reflectors preferably of the concentrating type equipped with watertight rubber sockets and submerged at the base of jet will project light a greater distance upward into the water and spray.
Trees	No. 1. 100-200 watts	Small trees—One or two 100-watts units Large trees—One or more 200-watt units Background trees—Small reflectors for 40 and 60 watts	In most cases the light is directed up into the trees from reflectors concealed in shrubs, behind fences, etc. Reflectors may be located on house, poles, etc. Best effects require some experimenting with two or more reflectors per tree. Often desirable to accentuate form of tree by lighting from at least two directions. Color seldom used—pale green or blue may be used effectively in some cases. Sometimes the use of green and clear light directed on the same area from different points is good—other colors generally not recommended except for bizarre effects.

Construction . . Methods . . . .

Quick Conduit Fastening in Brick Chases

To secure various vertical conduit runs in chased brick walls ahead of plasterers, the Hunter Hogue Electric Company, drove 16-penny nails

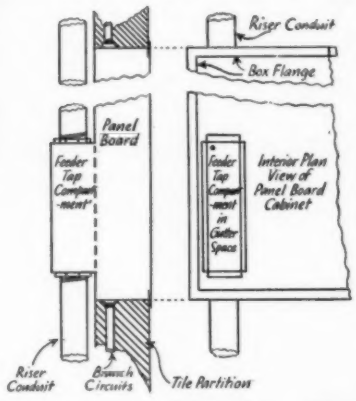
into the mortar seams and bent them over the conduit. Cement was then patched on at several places, thus holding the conduits back until a regular plastering coat completed the cast-in-place job. This work was done in connection with remodelling a commercial building at Atlanta, Ga.

Over-Night Protection for Drawings

Just a bit of inexpensive oiled cloth, unrolled and spread over the drafting table may save pencil tracings from becoming "smeary" or soot-covered between oft-prolonged sessions of completion, or over week-ends. Then, too, some blue prints or tracings are just a bit too confidential to be left spread out for curious office callers to discover. To avoid the bother of rolling them up, or of making some other unruly drawings stay put as a temporary shield, just throw on your piece of oiled cloth. This method is followed by Ray W. Chanaberry, Inc., Louisville, Ky., and is said to come in handy for temporarily covering and protecting tacked-down work in case the drafting board must be used for spreading out other drawings or tracings.

Beam-Dodging Riser Conduits

To add a set of special a.c. feeders for serving 28 floors in a Cincinnati, O., office building, the Bertke Electric Company provided special back-of-cabinet splicing compartments for



28 typical a.c. panelboards. These compartments allowed the installation of riser conduit in an existing shaft without drilling through concrete beams, and without having any splicing compartment covers face into the shaft. Extruded or flanged-out compartments, of sufficient size to make feeder taps in them, were welded into openings that were cut in the back wall gutter space of each panelboard cabinet. These compartments varied in depth according to the panelboard mounting conditions. For flush cabinets, they projected into the shaft just far enough to line up with the exposed riser conduit in the shaft. For surface cabinets, these splicing compartments were deep enough to project through the shaft partition and also to line up with the riser conduits in the shaft. Because the splicing compartments opened into the cabinet space, they had solid backs. Their flanged-out construction provided smooth rounded edges around the gutter access opening, thus minimizing conductor abrasion.

Test Procedure on Water-Soaked Insulation

Water-soaked wire and feeder cables cannot be tested in accordance with the procedure that is outlined in Article 500-o of the 1935 Code, because too often there are damp panelboards or other grounded equipment connected to the system. To determine the true insulation resistance values, tests should only be attempted after the conductors have been disconnected and spread apart at both ends. Any splices at junction boxes should also be pulled apart before starting in. Each conductor may then be tested separately for ground leaks to its raceway. It is also important to make tests for leaks between the conductors that are combined in one raceway, or that are in multi-conductor assemblies. The equipment should be tested separately for ground leaks.

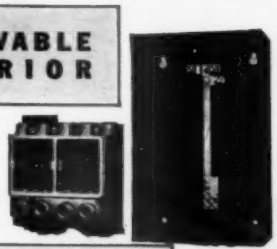
Although test standards for new 600-volt rubber insulation, when submerged in water range from 1,500 megohms for a 1,000-ft. length of No. 14 wire, down to 250 megohms for 1,000 ft. of 2,000,000 c.m. cable, a fair allowance must be made for old insulation. Some authorities agree that an old feeder cable of 50 ft. up to 250 ft. in length should test 5 megohms insulation resistance to its metal raceway, and about double that value between adjacent conductors. The very lowest acceptable value is considered to be 1,000 ohms per volt-rating of conductor insulation, that is, for 600-volt insulation, 600,000 ohms. For 3,000-volt cable the minimum value would thus be 3 megohms.

Because water-soaked systems may have wide variations of insulation resistance values, a megohmmeter that offers two scales often permits reasonably accurate readings being obtained. If only a high-scale instrument is used, ranging say from 100,000 ohms up to 200 megohms, those conductors having resistances below these readable limits cannot be accurately checked up. Furthermore, watersoaked con-

Sensational NEW C-H RANGE SWITCH

with the 3 BIG FEATURES

1 REMOVABLE INTERIOR



2 DEAD-FRONT CONSTRUCTION

3 NON-INTERCHANGEABLE MAIN AND RANGE SWITCH PULL-OUTS

Features which make this an Outstanding Leader

The new 4334H15 Range Switch announced by Cutler-Hammer is creating a sensation wherever it has been seen. Here are just *some* of its outstanding features:

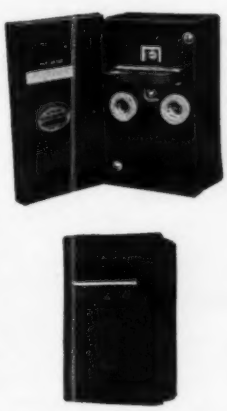
Loosening one self-locking screw permits you to lift out the entire switch assembly for easy installing, pulling wires, etc.

4334H15 has complete dead-front construction — for safety. Main and range switch pull-outs are non-interchangeable, constructed of tough C-H Thermoplax insulating material and employing contacts of ample current-carrying capacity with heavy fuse clips—they guarantee trouble-proof performance.

Other features are, briefly: solderless terminals with slotted hex-head screws; solid porcelain barriers between terminals prevent short circuits; fuse-test holes (you don't interrupt service); the tough, durable case is finished in C-H mar-proof black; ample wiring space on all sides; plenty of knockouts conveniently placed (meter twist-out at top available). Rating: 60 amp. capacity main and range switches with 4 branch circuits, 35 amp. tap for extra distribution panel or hot-water heater. The 30 amp. terminals have the easy-to-wire C-H holes. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus*, 1306 St. Paul Avenue, Milwaukee, Wisconsin.

And—*the New* 4142H1

WATER HEATER SWITCH



It's modern; it's good-looking; it has every desirable feature needed for modern service requirements.... Dead-front construction . . . silver-plated contacts . . . positive make and break . . . facilities for locking in either on or off position . . . entire assembly easily removed. 30 amps. capacity, 125-250 Volts A. C. 2-blade, 2-plug fuse, grounded neutral.

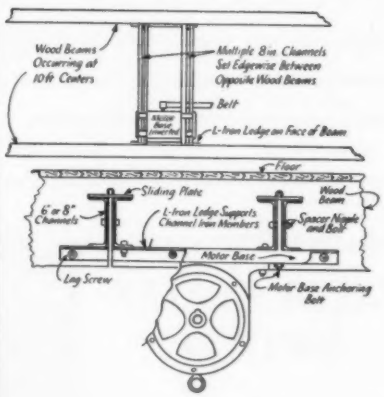
CUTLER-HAMMER C-H SAFETY SWITCHES

ductors that might come back to fair values as they dry out need not be subjected to testing potentials which are apt to puncture or break down the insulation. With low scale testing facilities from zero to 5,000 or 10,000 ohms, the initial test may safely be made without such danger of damage.

For running down the bad or leaky portions of large wiring systems that are not water-soaked, the tests may be started at the mains and run down in sections. Insulation resistance tests of motor windings are now being regularly made and charted for some industrial plants. The same procedure may be followed at regular intervals for wiring systems. Such tests will detect ground leaks, and preventive measures can be taken before feeder cable failures occur at important seasons of the year. The tests would usually need to be made at night in department stores and office buildings. Industrial plant tests can sometimes be made on certain days during their annual shut-down period.

Adjustable Mountings for Inverted Motors

About forty 20-hp. a.c. motors were mounted in an inverted and adjustable position within the typical bays of a mill-constructed textile plant, that was recently wired by the Marine Electric Company, of Louisville, Ky. Because occasional changes of machinery lines were



anticipated which would also necessitate shifting the motor drive positions, a standardized steel mounting frame was made up for these inverted motors that spanned wooden ceiling beams occurring at 10-ft. intervals. To provide sufficiently rigid members, two pieces of 8-in. channel iron were bolted together. Pairs of these double channels were

Seal the bargain with

SAFECOTE!

There is no substitute for Confidence

YOU don't have to be a salesman to get a job on a price basis. Any hole-in-the-wall electrician can beat you at that game. With little overhead, less inventory, and no responsibility he can undersell you nine times out of ten. But to take the job on a profitable, businesslike basis – is quite another story.

Your salesmanship can be only as good as your confidence in yourself, the material you use, and the workmanship you put into a job.

You know that Safecote wire has four outstanding qualities –

FLAME-RETARDING... will not carry flame. Braids and insulation free from damage during soldering or sweating into lugs.

MOISTURE-RESISTING... hermetically sealed against such destructive agents as moisture, light, and air. Condensation in conduits will not affect it. It improves with age.

FISHABLE, SLICK FINISH... patent-leather-like finish—easy to pull into conduits—more wires possible in a given size conduit.

FADELESS FAST COLOR... permanent circuit identification.

You know the value of these advantages – but your customer may not know one piece of wire from another... he may think all wire is alike; he *does* know about short circuits and the danger from wet wires, however – so tell him about Safecote. Sell him the advantages of Safecote – seal the bargain with Safecote.

There is no substitute for Safecote

THE TRADE-MARKS OF THE MANUFACTURERS AUTHORIZED T

PARANITE WIRE & CABLE COMPANY

GENERAL ELECTRIC COMPANY

TRIANGLE CONDUIT & CABLE CO., INC.

ROEBLING SAFECOTE JOHN A. ROEBLING'S SONS COMPANY

RUBBER INSULATED WIRES AND CABLES BISHOP WIRE & CABLE CORPORATION

COLLYER COLLYER INSULATED WIRE COMPANY

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GENERAL CABLE GUARDIAN GENERAL CABLE CORPORATION

HAZARD

SAFECOTE PERFORMANCE SPECIFICATIONS AVAILABLE UPON REQU

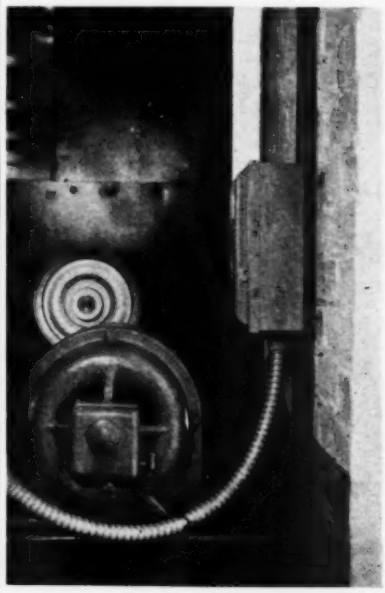
GEORGE C. RICHARDS, LICENSOR'S AGENT

set between the faces of opposite beams upon angle iron shoes or ledges. Spacers were interposed at the ends between each pair of channels, to provide a lengthwise slot that would clear the vertical bolts which held the inverted motor bases.

This assembling method made it possible to erect these supports piece by piece with little difficulty in final exactness of alignment. After a motor was once hung in place it could easily be shifted anywhere along the 10-ft. span, because its four holding bolts were provided with flat plates on the upper side of the slotted, two piece channel iron spans.

Back-Connecting Motor Starter With Surface Raceway

Surface metal raceways were installed in the Wiremold factory at Hartford, Conn., by the Perry Electric Company, for connecting numerous smaller motors. At a 1½-hp. magnetic starter a vertical run of No. 1100 Wiremold was "straddled" by using long machine screws and expansion shields to bolt the starter tight against the raceway. The



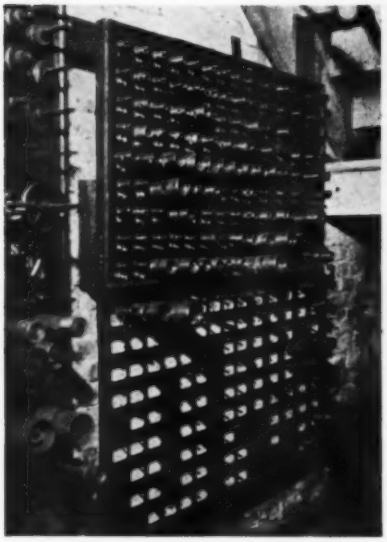
cover or capping was cut away for the exact length of the starter, and connections were brought into the back of its box through insulated bushings. This installation method permitted the base moulding being run in complete lengths without connecting fittings, after which the starter was set at the desired height before the capping was fitted on.


It's a Real Pleasure To Install
BULL DOG
Vacu-Break
SAFETY SWITCHES
EASE of INSTALLATION
with
Solderless Wire Grips and ample space for simplicity of wiring without intricate "Boondoggling".
PRIDE of INSTALLATION
with
Compact, Stylized Cabinets and all arcing DOUBLE SEALED for super-safety switching.
In performance and appearance, manifesting—
to a very high degree—
DISTINCTIVE MODERN QUALITY
BULL DOG ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN

Service Shop . . . Practice . . . . . .

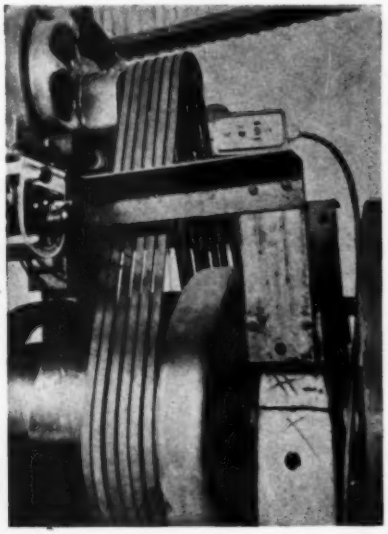
Bearing Sample Board

Exactly 252 sizes or samples of sleeve bearings may be mounted on a 48-in. by 60-in. display board at the Wm. C. Krauth Electric Company, Louisville, Ky. The 18 rows of pegs were made up from ¼-in. and 5/16-in. machine screws that were threaded through from the rear, and lock-nutted over washers on the face of the ply-wood display board panels.



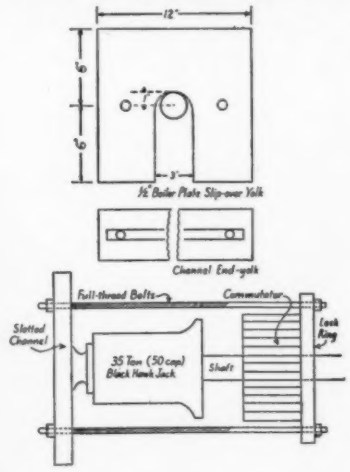
Multi-Speed Lathe Drive

Having recently acquired a used heavy-duty 30-in. swing lathe for doing machine work on its larger motor jobs, the Cleveland Electric Company, Atlanta, Ga., immediately converted it to short center V-belt drive. The installation of a 4-speed squirrel-cage motor, a 6-member V-belt drive, a speed-selecting drum-switch, and a flexible connected push button to operate from varied positions along the lathe a magnetic control switch, provides a conveniently controlled shop unit which operates without overhead counter shafts or long belts and without the need for belt shifting levers at the lathe. The motor selected for this drive is rated 5 hp., 450/600/900/1,200 r.p.m. A special base and motor bracket was built in the shop to fit the lathe. Because four motor speeds are readily obtainable by operating the drum collector switch, the V-belts will be operated only on the largest speed cone pulley of the lathe spindle.



Portable Hydraulic Assembly

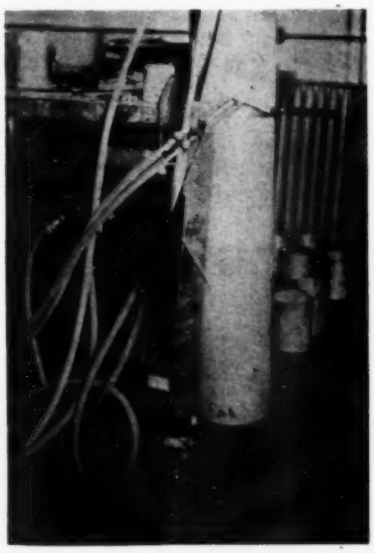
Stubborn commutators, slip rings and pulleys can be removed from large motors without taking the motor to a ram press by using the equipment that has recently been assembled by the Birmingham (Ala.) Electric & Manufacturing Company. A jack is used to push against the shaft in a manner similar to a small "pulley jerker." Special heavy-duty yolks and bolts, operated in conjunction with a compact 30-ton hydraulic oil-power jack permit a 2-man crew to set up this outfit quickly at rotors or armatures on the shop floor, or out on a job. It is stated that pulling jobs which have sometimes taken 6 or 8 hours can often be done with this equipment in less than an hour. For some jobs a slip-over yolk of ½-in. thick steel is set over the shaft, while in other cases it is possible to



attach the jackbolts through the holes in commutator lock rings to obtain the desired supporting medium.

Handy Clamp for One-Man Welding Jobs

An old fan base with a length of 2-in. channel iron welded to it provides extra hands for the welder at Berger Bros. Electric Motors, Inc., Rochester, N. Y. Jobs which would often require an assistant are done by one man, because he clamps his flame jet at the desired angle, adjusts the flame and is then free to move his equipment, handle his welding rod and do other things as may be required. This clamping stand is



ANNOUNCING....

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Segment — Moulding — Heater and Flexible Mica Plates

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The General Electric Company announces a complete line of Mica for your requirements. G-E Mica, the same as used for the manufacturing of General Electric apparatus, equipment and appliances, is produced with the most scrupulous care in selection of materials and with highly exacting testing and inspection. In many cases the mica is x-rayed to safeguard against the presence of metallic particles. All these precautions help to assure superior insulating properties.

The various types of G-E Mica Plate are bonded with Glyptal or shellac. Glyptal increases the resistance of the mica plate to electric arcs, to high temperatures, and to oil, and also creates greater density of the plate which results in improved electrical properties.

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Section M-687, Insulating Materials Division,
General Electric Company, Bridgeport, Conn.

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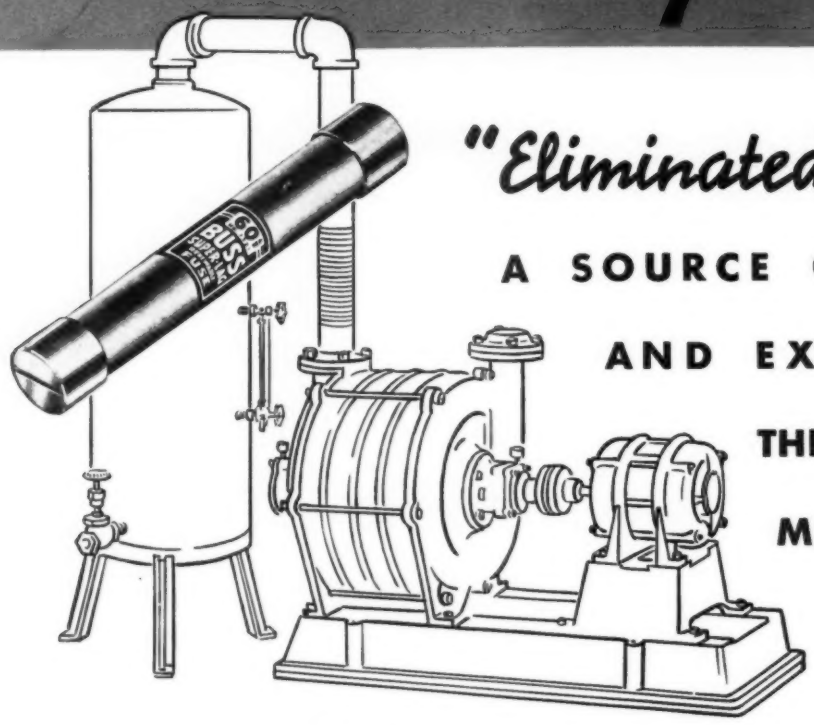
fuses

MADE TO *protect*

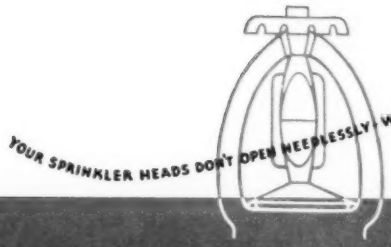


"Eliminated...

A SOURCE OF TROUBLE AND EXPENSE FOR THE U. S. HOFFMAN MACHY. CORP."

—SO SAYS Mr. Smith of the Smith-Lipman Electric Co. Baltimore, Md. "They called us in because the 5 hp motors on their vacuum pumps were blowing 30 ampere 250 volt fuses whenever the operators were careless about gradually bringing the compensator up to full current.

By discarding the old fuses and installing Buss Super-Lag fuses we found that we could entirely eliminate the trouble. The long time-lag of Buss fuses kept them from blowing on the starting current."



. . . NOT TO BLOW!

YOU TOO, *can prevent the* RECURRING SHUTDOWNS *caused by* NEEDLESS BLOWS

The long time-lag that Mr. Smith refers to is just one of the features that makes it possible to build "Fuses made to protect—not to blow." The important point is that another executive interested in plant operation has found a practical way to eliminate the senseless shutdowns so often permitted by ordinary protective devices. He found that it paid to investigate . . .

WHY BUSS FUSES DON'T BLOW NEEDLESSLY

10 Features and ***The* Super-Lag**

in the design of the FUSE-CASE help make it possible . . . .

development in the FUSE LINK completes the job.

GET THE FACTS

You will find this new book on fuses of refreshing interest.

It sets up in concise, fast reading style, the facts about fuses and their relation to the cost of plant operation.

It will give you authoritative information that will be valuable to you in any discussion of fuses or any feature of the problem of electrical protection.

Your name and address will bring you a free copy. Just ask for the Rb book on "Fuses made to protect—not to blow."

BUSSMANN MFG. CO.
University at Jefferson
St. Louis, Mo.

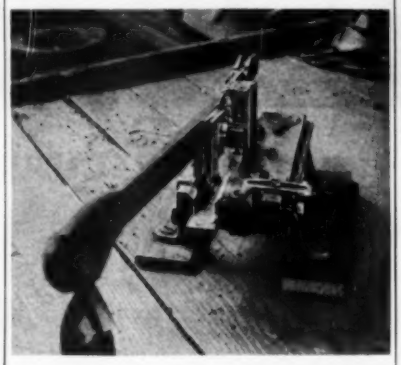
Division of McGraw Electric Co.

BUSS super-lag FUSES

provided with drilled and tapped holes on 6-in. centers into which ⅝-in. holding bolts may be screwed by hand for clamping the welding outfit at any desired height or angle.

Clip Former for Loop Coils

The narrow tin clips which are usually hand-bent around stator coils, are made up quickly with an adjustable forming tool that was made up in the shop of the Armature Winding Company, Charlotte, N. C. A sliding "jig" adjustment permits the base groove or slot to be varied in accordance with the dimensions of the coils that are being made. Likewise the forming head or block upon the hinged lever may be increased in thickness with additional steel shims of laminated steel. After a strip of tin has been bent into a U shape the lever is interlocked with an ejector which throws the clip out as the lever is released.



Transport Skids for Heavy Rotors

For handling heavy rotors and armatures between service shop and plants, in the steel mill and mining industries around Birmingham, Ala., substantial skids are needed that will withstand rough handling, which will protect the apparatus from mechanical injury, and which will also simplify transportation problems. The wound rotor photographed in the service shop of the Birmingham (Ala.) Electric & Manufacturing Company is from a 700-hp., 300-r.p.m., 25-cy., 3,300-v. hoist motor in an iron ore mine.

Bottom skids, braces, and shaft cradle blocks were made of 6-in. by 6-in. timbers. The blocks are bolted to the skids with ¾-in. stay bolts. Special filler blocks were placed between the rotor spiders and the cradle blocks to prevent end-play.

. . . "Because, Mr. Contractor, no clapper switch can match the performance of this solenoid starter"

"In motor starters you and your customers are primarily interested in reliability. The Allen-Bradley Bulletin 709 solenoid starter is far more reliable than the old style clapper switch starter, because there is no swinging arm, no bearings, and no flexible shunts—all details of construction which can and do cause trouble.

"The straight line up and down motion of the Bulletin 709 solenoid mechanism takes less space than the swinging clapper motion, and the solenoid operates without friction. Therefore, pick-up and drop-out voltages are much lower so that voltage fluctuations do not cause unnecessary shutdowns. Furthermore, you'll appreciate the wiring space in the cabinet. It makes wiring easy, saves skinned knuckles, and cuts down time and cost when making the installation.

"The straight line motion also permits the use of completely enclosed double break, silver alloy contacts. Thus, flexible connectors are avoided and the current interrupting capacity is so stepped up that every Bulletin 709 starter will safely switch not less than ten times its maximum horsepower rating. Finally, Mr. Contractor, Allen-Bradley contacts require no maintenance. Your customers will never need to file or dress them—therefore, contact life is not filed away and wasted.

"Play safe—be up to date—save installation cost—install Allen-Bradley Bulletin 709 solenoid starters on every one of your motor jobs."

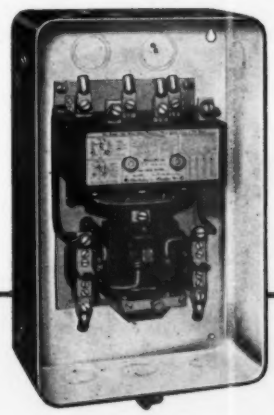
Allen-Bradley Company
1307 S. First St., Milwaukee, Wis.

Easy to Install

Allen-Bradley Bulletin 709 solenoid starters are easy to install. The switch mechanism can be bolted directly to metal surfaces, if desired, without additional insulation. All wiring is accessible from the front. White cabinet interiors provide better illumination in dark places.

Bulletin 709 solenoid type automatic across-the-line starters are available for every type of service. Maximum ratings:

Size 1—5 hp, 220 volts
7½ hp, 440-550 volts
Size 2—15 hp, 220 volts
25 hp, 440-550 volts
Size 3—30 hp, 220 volts
50 hp, 440-550 volts



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SOLENOID MOTOR CONTROL


TELLING THE
MONEY-SAVING STORY
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ELECTRUNITE STEELTUBES
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TO YOUR CUSTOMERS
EVERY MONTH
The economics of slum elimination projects demand ELECTRUNITE Steeltubes
WORLD'S MOST MODERN RESEARCH BUILDING WIRED WITH ELECTRUNITE Steeltubes
100,000 BUILDING OWNERS
can't be wrong-
IN BUILDINGS OF EVERY TYPE ELECTRUNITE Steeltubes IS AFFORDING PROTECTION TO ELECTRICAL WIRING . . . .
Electrical Division Steel and Tubes Inc. CLEVELAND OHIO
ELECTRUNITE Steeltubes
THE SAFE LOW-COST RACEWAY FOR WIRING IN MODERN HOMES

BUILDS YOUR BUSINESS

Steel and Tubes, Inc., has spent millions of dollars in the development of ELECTRUNITE Steeltubes—the modern electric resistance welded Electrical Metallic Tubing that affords adequate protection to wiring at low cost.

And, today, Steel and Tubes, Inc., is spending more money—thousands of dollars—to bring the story of ELECTRUNITE Steeltubes to architects, builders and business executives—to help you obtain more wiring business at a greater profit. Every month advertisements feature this low-cost raceway for wiring—tell about its many advantages, ease of installation and long life.

Building is on the up-grade—wiring contracts are increasing—many specifications will include ELECTRUNITE Steeltubes—other jobs will leave selection of conduit up to you—and if you use genuine ELECTRUNITE Steeltubes, the pioneer electrically welded threadless conduit that requires only three simple fittings, that cuts and bends easily, and with a knurled inside surface that makes wire pulling 30% easier, you'll obtain more contracts, make more money and install jobs which you can be proud of.

Why not take advantage of what Steel and Tubes, Inc., is doing to help electrical contractors and reap your share of the profits? See Sweet's for details, ask your electrical wholesaler for prices on genuine ELECTRUNITE Steeltubes. It costs no more than ordinary tubing.

Electrical Division

Steel and Tubes *Inc.*

WORLD'S LARGEST PRODUCER OF ELECTRICALLY WELDED TUBING

CLEVELAND . . . OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION

KNURLED INSIDE FINISH AVAILABLE IN ½", ¾" AND 1" SIZES

As mounted, this heavy unit was handled with safety, and without danger of toppling over. The size of this rotor, standing over 5 ft. above the floor, may be better appreciated by its smaller companion, a rotor from a 30 hp. motor.

On-the-Job Oven

When the Devlin Electric Company began to replace the flood damages in a large Pittsburgh, Pa., theatre and office building, a sheet steel bake oven was quickly ordered

from a local sheet metal works and set up back stage. This oven was made 6 ft. high, 4 ft. wide and 3 ft. deep, with double doors. It had a perforated coke grate at the bottom. Because temporary power was available soon after the work started, 660-watt radiant heater elements were used instead of the grate. Three shelves were provided in the oven to accommodate the many starters and equipment parts that had to be reconditioned. Larger units, such as motors and transformers were sent away to service shops.

Lighting Data

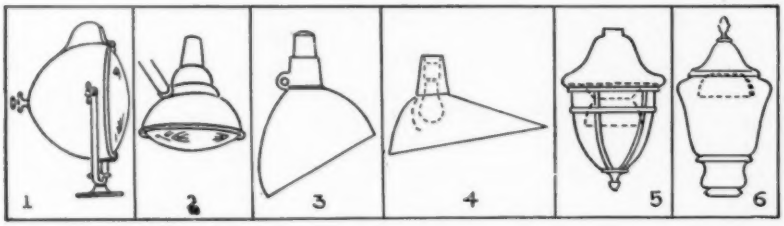
Rating Table for Gasoline Station Lighting Equipment

In addition to the ability of a particular type of unit to illuminate an area efficiently, two factors must be considered; first, if improperly placed and mounted, the unit may be glaring; second, even though well placed to avoid glare the equipment may prove objectionable because of excessive light spilling on to adjacent properties and perhaps into sleeping rooms.

Under the heading of "Efficiency in Illuminating Desired Area for a Given Wattage," it has been assumed that the equipment is so placed as to avoid glare. A low rating under this heading may usually be the result of lack of control of the light resulting in objectionable spill.

"Ease of Servicing" includes all of the servicing factors such as, the ease with which lamps can be renewed, frequency of cleaning required, and the accessibility as affected by the mounting height.

The units are rated: A—Excellent, B—Good, C—Fair, D—Unsatisfactory.



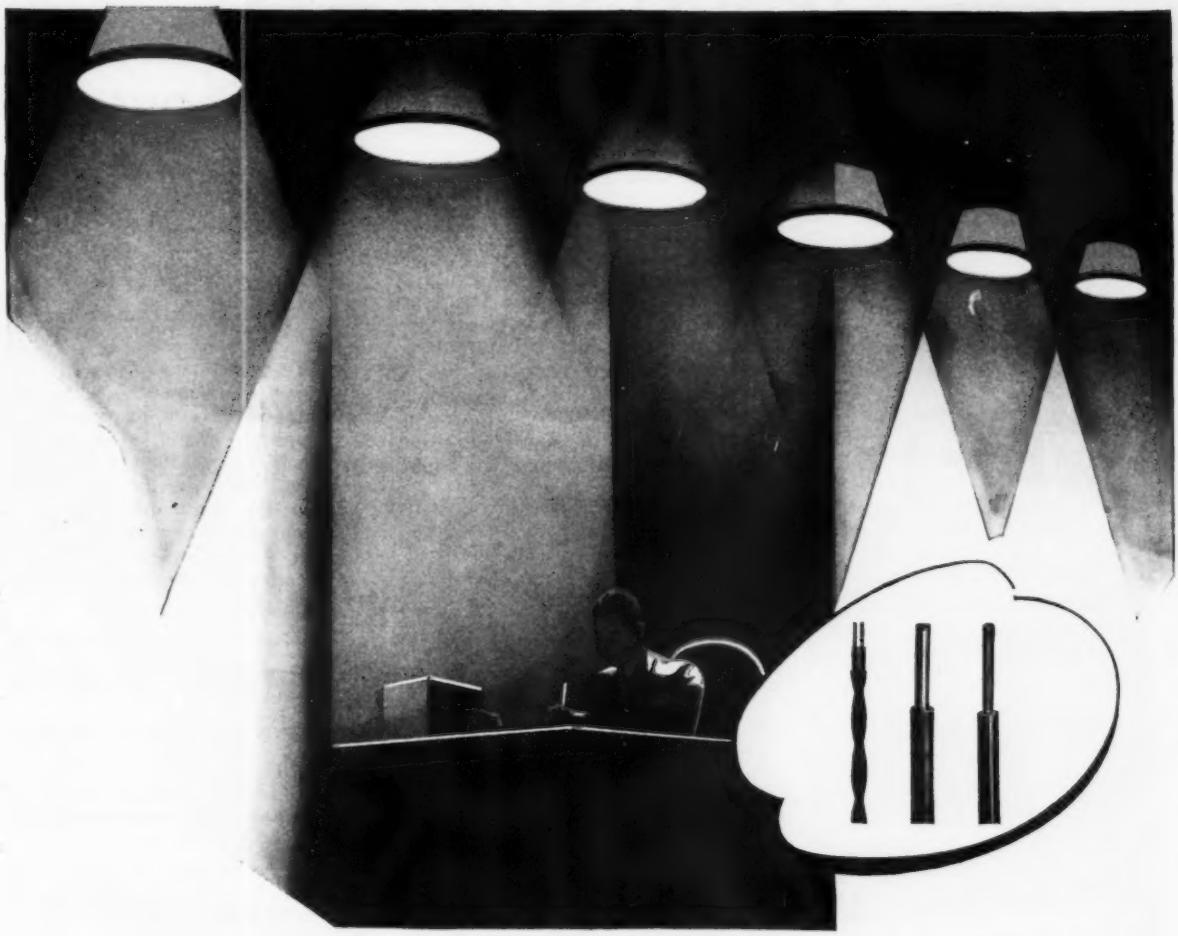
Rating Table

	TYPE OF EQUIPMENT	Efficiency in illuminating desired area for a given wattage.					General Appearance		Maintenance of lighting efficiency	Ease of servicing
		Mounting Height (Good Practice)	From less than 30 ft.		From more than 30 ft.		Of Unit		Of lighted area		
			Bldg.	Yard	Bldg.	Yard	By Day	At Night			
1	Closed-Type Floodlight Proper cover glass and polished or mirrored surface reflector.	Not less than 25 ft.	B	C	A	A	C+	B+	A	A	C
2	Closed-Type Floodlight Proper cover glass and polished or matte-finished metal reflector.	Not less than 25 ft.	A	B	B	B	C	B	A	B	C
3	Open-Type Floodlight No cover glass. Diffuse reflecting surface. May be equipped with auxiliary reflector for more directive control of part of light.	Not less than 20 ft.	B—	B	C—	C	C	B—	B	D	C+
4	Open-Type Floodlight No cover glass. Diffuse reflecting surface—Equipped with auxiliary reflector.	Not less than 20 ft.	B	B	B—	B	C	C	B	D	C+
5	Pendent-Type Street Lighting Unit. Semi-diffusing glass globe equipped with refractor.	From 16 ft. to 20 ft.	B	A	C—	C	A	B	B	A	B+
6	Upright-Type Street Lighting Unit. Semi-diffusing glass globe equipped with refractor.	From 14 ft. to 18 ft.	B+	B	C—	C	A	A—	B	B+	B
7	Ornamental Floodlighting Luminaire. Semi-diffusing glass globe and polished, or mirrored, reflector.	Not less than 18 ft.	A	B	B+	B	A	B	A—	B	B to C

Economic Lamp Burning Voltage

Is it economy for customers to burn lamps under voltage to save on renewals? In order to analyze this problem assume that the purchaser of light is operating 120-volt lamps at 115 volts. The wattage input is decreased to 93.5 per cent and the candlepower output reduced to 86.0 per cent. This means that 7½ per cent of the power used is absolutely wasted. If 300-watt lamps are used, this amounts to 22 watts, or a waste of 22 k.w. hours during the normal 1000 hours burning of an incandescent lamp.

Interpreting this in terms of lamp renewals, it is found that the life of a lamp burned 5 volts under normal voltage is increased from 1000 hours to 1600 hours. If the net lamp cost (assuming that the lamps are purchased on a $600 contract) is 71 cents, renewal cost per 1000 hours is



USE DELTABESTON FIXTURE WIRE
FOR COMMERCIAL AND INDUSTRIAL LIGHTING

Modern lighting efficiency demands that high-voltage lamps be used. Only fixtures wired with Deltabeston Fixture Wire are equal to the strain and give permanent uninterrupted service. Deltabeston outlives and outlasts all other fixture wire. Two exclusive Deltabeston processes which purify the asbestos and felt it on the conductor assure greater resistance to moisture—more dielectric strength—better insulation resistance—flexibility at all temperatures. Deltabeston Fixture Wire can be bent without cracking or reducing the thickness of the insulation. It can be stripped freely and easily.

Deltabeston Fixture Wire is available suitable for wiring all sorts of lighting fixtures, show case lighting, special lighting, etc. For samples and complete information on all types Deltabeston Fixture Wire write to Section Y-687, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

DELTABESTON FIXTURE WIRE

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONN.

reduced from 71 cents to 44 cents; a saving in renewals of 27 cents per 1000 hours. However, there is a waste of 22 k.w. hours every 1000 hours, and at an energy rate of 3 cents per k.w. hour, the cost of this waste is more than twice the amount saved in lamp renewals.

Glare

Glare is negative light. The more you have, the less you see. The waste of footcandles required to overcome lowered visibility due to glare is shown in the accompanying illustration.

At this machine a glaring local light causes contraction of the pupils

and a consequent decrease in the amount of "seeing" light entering them. As will be noted from the photograph 42 to 84 per cent, depending on the location of the local light with respect to the eyes, of the useful light is wasted counteracting the effect of glare.

In a like manner, reflected glare obtainable from glass-topped desks, glossy paper, store counters, etc., may prove equally costly. An intelligent analysis on the part of the contractor is required in selecting equipment and locating it so as to insure good diffusion and proper direction.

The extent to which glare is objectionable is partially dependent upon the contrast in brightness between light source and background.

Glare is often unwillingly caused by using a lamp that is too large for the globe. The following table gives the recommended minimum diameters of enclosing globes.

Classrooms & Offices Wattage	Globe Size Inches	Stores Wattage
100	12	100-150
150	14	150-200
200	16	200-300-500
300	18	300-500-750

EVERY ELECTRICAL CONTRACTOR *should have a copy*

NEW *Sales Manual* ON SERVICE STATION LIGHTING

Show Service Station Prospects this NEW GUIDE *to* RIGHT LIGHTING

When the service station operator *understands* HOW TO GET RIGHT LIGHTING as well as WHAT right lighting means to service station profits, he stops being a prospect and becomes *your* customer!

To help electrical contractors drive home the HOW as well as the WHAT and WHY of right lighting, is the purpose of Benjamin's new book, "What Every Service Station Operator Should Know About Lighting." In this 34 page Guide are included lighting diagrams showing HOW to properly *floodlight* buildings and grounds; how to *light* pump islands, station signs, auto laundry, washing department, service operations and parking lots.

Everyone interested in selling Right Lighting to Service Stations should have a copy . . . Benjamin invites you to

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PRINT YOUR NAME AND ADDRESS ON MARGIN BELOW

Code Chats . . . . .

Questions and answers relating to the interpretation of the National Electrical Code . . .

Conducted by F. N. M. Squires

Chief Inspector New York Board of Fire Underwriters

Service Entrance Cable for Interior Work

When service entrance cable as provided for in 513-a is used for interior wiring systems, would it have to be grounded? When used for entrances, rule 904-a requires the sheath to be grounded.

If the service entrance cable is of a type having a metallic sheath, the sheath must be grounded when the cable is used for interior wiring.

It must be remembered that the "bare neutral" type of service entrance cable can be used as such only on range installations inside of buildings.

Of course, the "bare neutral" type in a 3-wire assembly could be employed for a 2-wire circuit by using only the two insulated conductors for the circuit wires and then using the "bare neutral" as an armor and grounding it as an armor, *not* to the neutral of the supply system.

Number of Permissible Conduit Bends

In reference to 503-j "Permissible Exceptions to Table 1," what constitutes two quarter-bends? Are two service ells, or two ell condulets of any kind considered the equivalent of two quarter-bends?

The local power company states that a conduit fitting is considered as a pull box and that one may install as many as one wishes in a 1-in. conduit carrying three No. 6 wires. My contention is that a conduit fitting constitutes a 90-deg. bend, and therefore, in a run containing more than two, a 1¼ in. conduit is required.

The relationship between conduit size and wire size and number of wires is necessary because the wires have to be pulled into the conduit without undue damage to the insulation due to friction. If the conduit is too small for the number and size of wires used or if the pulling is too hard on account of too many bends in the conduit then abrasion of the insulation will occur.

Therefore, for a number of wires of given sizes, the conduit sizes required have been set forth in the tables in rule 503-j and these are given for conduit runs having not more than four quarter-bends.

But where the conduit run is not over 50 ft. and does not contain more than two quarter-bends certain exceptions to the requirements of Table 1 of 503-j are permitted.

By the equivalent of two quarter-bends is meant that there shall not be a bending of the conduit from fitting to fitting to exceed 90 deg. This might be one right angle (90 deg.) bend or two quarter (45 deg.) bends or three 30-deg. bends or any combination of any degree of angle bends which does not total more than 90 deg.

The run of conduit to be taken into consideration is the run between any two fittings between which the wire is to be pulled. An outlet box, a junction box, or a pull box, is considered as a fitting. For instance, if there was a distance of say 200 ft. to be covered, three pull boxes could be inserted at 50-ft. intervals between the two end fittings and each run would not exceed 50 ft. and, therefore, the "exception to Table 1" could be employed.

If the conduit enters the fitting at any angle, that is, by means of an elbow or angle connector, that angle is to be figured in. But, any bend in the wire in the box or fitting after leaving the conduit is not to be considered.

In the condition quoted by our correspondent, he may install any number of pull boxes in a run of 1-in. conduit and use three No. 6 wires as long as the boxes are not over 50 ft. apart.

A service ell, while effecting a 90-deg. change in direction, does not count as a 90-deg. bend as the wires are pulled into and from this fitting.

BOOTLEG FIRE HAZARD: An $800 fire loss resulted in a Brooklyn, N. Y., apartment house when a defective outlet overloaded a long piece of armored cable that was tapped to a cutout containing "bridged" plug fuses. The armored cable had been draped along the third floor, suspended in a dumbwaiter shaft and then extended to the basement fuse cabinet by a "handy man." The fuses had been cut solid, causing the short-circuited conductors to become so hot as to completely consume the insulation for more than 30 ft. Firemen opened the service switch before any overcurrent devices had functioned.

Over-Current Units on Motor Circuits

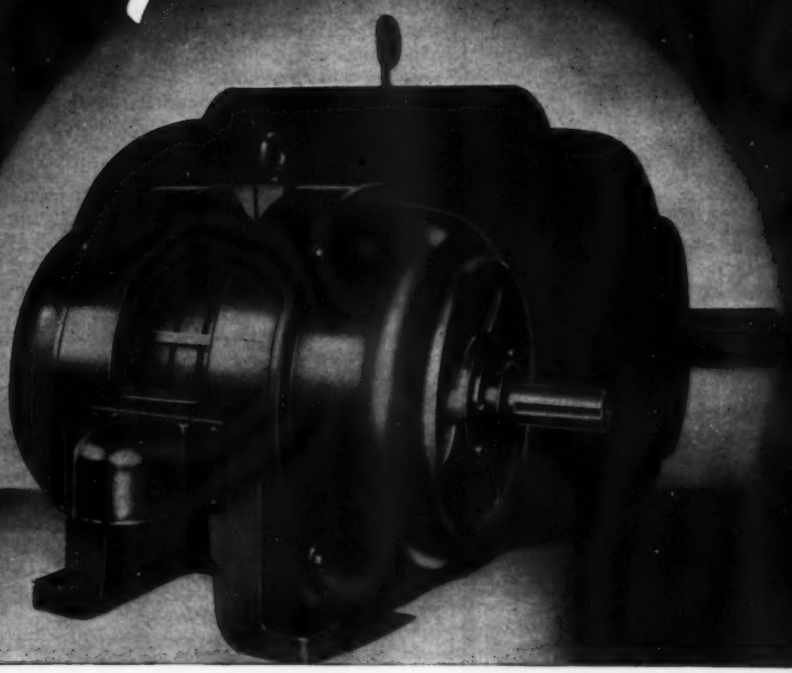
Section 808-c-3 states that when fuses are used for motor running protection, they shall be inserted in all ungrounded conductors; paragraph c-4 states that when automatic over-current protective devices other than fuses are used, that the number of devices used can be decreased as listed in the table following.

What greater hazardous condition would exist with the same number of fuses used for motor running protective devices as are allowed when other types of devices are used?

The question here relates to the over-current protection required for a motor while it is running as designated by the caption of paragraph 808-c which is "Motor running protection."

The above mentioned paragraph does not in any way lessen the number of protective devices required to protect the conductors of the motor branch circuit as required by rule 808-b-2. This latter rule requires that a motor branch circuit protective device be provided for each ungrounded conductor. This protective device is to provide short circuit protection and, therefore, may be of such a size (governed by 808-b-2-u) as not to provide protection against

LITTLE THINGS MAKE A *Great* MOTOR



...AND F-M MOTORS HAVE THEM ALL!

NEARLY anyone *could* make a motor. The fundamentals of motor design are in the textbooks of every engineering school. But more than fundamentals are required.

It's the *little* things gleaned from long engineering experience that make a *great* motor! The little things like one-piece phase group windings that have no soldered leads to melt out . . . self-locking cuff insulation to prevent slippage and protect windings under severe service . . . sealed-in leads that can't pull out or short under strain in installation or operation . . . dynamic rotor balancing and vibrometer tests for smooth running.

You'll find all these little *big* things that make for longer motor life and more successful performance in Fairbanks-Morse motors. The little *big* things that give you more for your money every time. Before you buy, investigate what extra advantages F-M motors can give you. Address Department J421, Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Illinois. 34 branches at your service throughout the United States.

106 YEARS OF PRECISION MANUFACTURING

FAIRBANKS-MORSE

Motors

POWER, PUMPING AND WEIGHING EQUIPMENT

over-current due to an overload which does not reach short-circuit proportions. This over-current protection may be, under some circumstances, as high as 300 per cent of the normal safe carrying capacity of the wires. Now, in addition to this motor branch circuit short-circuit protection the Code, in rule 808-c requires protection for the motor itself against over-current during the running period.

On account, therefore, of the short-circuit protection required and used on each conductor it is not necessary to furnish additional over-current protection in each conductor but only to furnish sufficient protective devices, in each case, to interrupt the current to the motor. This is true because if the current to a motor is interrupted the excessive, or over-current, due to overload is also interrupted and damage to the motor avoided. Therefore, the number of over-current protective devices as shown in 808-c-4 may be used.

It must be borne in mind, also, that with the use of the over-current devices other than fuses, with over-current units as indicated in 808-c-4, the device operates to open all conductors.

Outlet Box for Finished House Work

Is it mandatory under 512-c to use a one and 1½-in. deep outlet box under the following conditions?

In an old house wiring job, where the house is in good repair, having a hardwood closely matched and varnished floor above and a wood lath and plaster construction below, to put a light opening in the ceiling using a 4-in. outlet box 1½-in. in depth, it would be necessary to remove a section of one or two lath, which with sand plaster would be liable to cause some of the plaster to fall, and also would leave the loose ends of lath without support. In order to support this box it would be necessary to take up the floor above, which would cause damage as the very finest saw made would leave a crack when the boards were replaced.

As this refers to a residence with no heavy fixtures to be mounted, would it not be complying with the Code if this light opening was fished in using a ½ in. deep box, with properly bushed clamp for the cable, and either mounting the box on a joist or use an old work metal bar hanger, which covers a number of lath for supporting the box? This would eliminate cutting in two of the lath and disturbance of the floor above.

Rule 512-e of the National Electrical Code specifies the manner in which outlet boxes are to be secured in new building work, and by thus stipulating the method to be employed does not, of course, require this same method to be employed when wiring an old house. Also 512-c permits the use of a box of not less than ½ in. internal depth where the use of a deeper box would require the cutting back of beams. Inspection departments quite generally permit the use of the ½ in. deep pressed steel box, generally called, "pancake box," mounted, either directly on the lath, or permit the cutting away of the lath, and the mounting of the box on the beam, where the outlet would come directly beneath the beam. Of course, this latter arrangement does somewhat weaken the lath and plaster as it leaves the end of at least one lath floating without support, although a good plastering job will generally hold intact.

Of course, if it is desired to use a box of 1½ in. depth and the condition of the house will permit the cutting away of a portion of about two laths, then such a box could be used by means of a bar hangar running from beam to beam. This, of course, would necessitate cutting again in the plaster back to the beams on either side of the box in order to secure the bar hangar to the beams. In this way it would not be necessary to take up any of the floor above, which, of course, inspection departments desire to avoid where possible.

Approved Cords on New Lamps

Are cords that are attached when an article is purchased supposed to comply with requirements?

In general, the cords attached to portables which are listed as approved by Underwriters' Laboratories, will be accepted as not of excessive lengths by the inspection bureaus. Of course, the listed lamps will have only an approved type of cord attached to them which fact is attested to by the small paper bracelet label which is placed on the cord at approximately 5-ft. intervals. These bracelet labels, however, prove only that the cord is of an approved type and does not prove that the whole appliance is approved, nor that the length is not excessive.

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SIMPLE

ALIGNED AUTOMATICALLY

FAILING to clean thoroughly the casing of a renewable fuse shortens its useful life. Point out to prospects that imperfect cleaning costs many extra casings — that a casing which is easily, thoroughly cleaned is far more apt to be cleaned.

There are no obstructions to cleaning in a Jefferson-Union casing. The volatilized metal can be removed — easily, quickly. The fibre used is the strongest and toughest that long experience has found. And the fusible link is designed to reduce the amount of metal volatilized to a minimum. Misaligned or twisted fusible elements — another cause of ruined fuses — are avoided with Jefferson-Union Fuses. They cannot be assembled wrong. Many renewals, minimum yearly fuse costs are assured by Jefferson-Union Renewable Fuses.

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Renewable FUSES

ELECTRICAL CONTRACTING

S. B. WILLIAMS, Editor

Wanted: A Slogan

WHEN the florists put over their national promotion campaign they had a slogan "Say it with flowers." Likewise, the paint industry to sell more painting said "Save the surface, save all."

The electrical industry has the job of promoting adequate wiring and it also needs a slogan that will give the whole story and be an urge to the public to buy more wiring.

Suggestions will be appreciated.

Direct Buying

ELECTRICAL wholesalers are becoming concerned over the increasing volume of direct purchases by contractors from manufacturers. To counteract this the National Electrical Wholesalers Association is considering a promotional program to show contractors why it is to their advantage to buy from member houses.

For years the National Electrical Contractors Association has had a trade policy that defined the most economical and efficient distribution as manufacturer to wholesaler to contractor to user. It has tried to sell this idea to manufacturers and to wholesalers. Unfortunately the wholesalers while in accord on the first step have not organized their operations in step with the rest of the program.

If the wholesalers wish to recover that business of the contractor that is now going direct to the manufacturer, they must be prepared to:

1. Show the contractor in hard cold fact why it is to his advantage to buy from the wholesaler at higher prices than he can get the same materials in similar quantities direct from the manufacturer.

2. Maintain a uniform policy with respect to all contractors for like purchases. This refers not only to price but also to terms. Special consideration for certain contractors on certain jobs only act as further incentive to direct buying. Credit terms that permit job pyramiding make it necessary for competing contractors to seek price and term advantages elsewhere.

3. Adopt a policy of not selling the contractor's customers direct except at a price and on terms which the contractor can meet profitably. Large numbers of industrial contractors have been forced to make direct alliances with manufacturers in order to hold the business of their customers against by-passing by the wholesalers.

4. Maintain adequate stocks so that contractors can be sure that they will receive prompt and complete deliveries as specified.

5. Maintain a sales personnel that understands the use and the advantages of the products carried. This is particularly true of industrial equipment.

The thinking contractors, by and large except for large operations, are willing to see the manufacturer-wholesaler-contractor-user chain of distribution maintained, but it must be maintained at the bottom as well as at the top.

Protected Neutral

A NEW bare neutral assembly known as "protected neutral" cable and consisting of one or more insulated wires about which is wrapped a stranded bare neutral conductor, the entire assembly being protected with a heavy paper wrapping and then covered with regular sheathed cable braid, is finding its way into a number of places for use in trial installations.

This new material, offered as a cost saving substitute for knob and tube, armored cable or sheathed cable wiring, is being promoted largely for use in the rural areas where for the most part there is no inspection and where the installations are made by the least competent of the wiring group.

Eight of the leading wire manufacturers make the new cable but its use in being promoted by the local utilities in the trial installation areas. Their reason for urging the use of this cable is lower cost, claiming that it can be purchased for 17 per cent less than sheathed cable.

This in itself wouldn't amount to much because the cable after all is only a small part of the total wiring cost. The next step is to bring out a line

of self contained switch and receptacle units for the purpose of eliminating the use of separate boxes.

While undoubtedly the use of protected neutral cable with boxless wiring devices will result in some savings in the cost of wiring, will it of its own accord bring a more adequate wiring job? If the same effort were put behind standard accepted products as is put behind the new protected neutral cable, how much difference would there be in the results as far as the amount of wiring is concerned?

There is another point to be considered and that is the necessity for state regulation of wiring if this new product is accepted into the National Electrical Code. It would be unwise to permit bare neutral to be installed promiscuously in rural areas that are unprotected by fire fighting forces.

—◇—

The Public Wants Safe Wiring

THE old fear that the public would curtail the use of electric service if it were told of the attendant hazards is gradually lessening as one demonstration after another gives convincing evidence that the public is eager to know how safety can be secured.

An inspector in Kenosha, Wis., talks to all kinds of local gatherings setting up experiments showing the hazards of faulty wiring and appliances. People instead of cutting down on the use of electricity ask that their buildings be reinspected. In Green Bay, Wis., the annual electrical safety shows drew 15 per cent of the families. In Mount Vernon, N. Y., a campaign on safe wiring served merely to make the public seek to correct defects. The safety exhibit put on at the Cincinnati Electrical Show this spring is being repeated elsewhere in the city by request. The Southern California electrical inspectors' exhibit of wiring hazards is meeting with public approval.

We could go on for pages with evidence of public interest, all of which would show that now is the time to cast out the old fear complex and boldly confront the public with the hazards that accompany poor wiring and show how easily safety can be assured.

Almost all of the exhibits and demonstrations so far are locally conceived and put together. Cannot the industry help these local fellows in this work? Standard displays can be worked out, photographic and actual evidence collected, pamphlets printed. Just another job waiting for a central industry business development organization.

—◇—

Union Employment

SOME very illuminating figures on the employment and income of union electricians have been compiled by the I.B.E.W. Research Department for the past five years. As summarized in the news section of this issue, they offer eloquent reason why the union has so zealously guarded the wage scale.

Unfortunately, these figures cover only the past five years, because it would have been very much worth while to have similar data back say to 1920. It would also have been interesting to have for comparison similar data for other groups of the building trades.

However, the figures do show, provided arithmetical averages can be taken, an average annual income per inside wireman for the past five years of $773.40 or $14.87 per week. While it is true that the present income per wireman is higher, it is still less than $20 a week, and if the worker were to average full working time the weekly pay envelope, as an average, would be less than $45.

In other words, there is something materially wrong with an industry that can pay its skilled workers only $14.87 per week during a five-year period when the full time incentive is only about $45 per week. Of course, there are cities with higher wage scales where the workers can earn much more in good times, but these figures are national averages. It must be obvious that such figures are not sufficiently attractive either to draw young men of ambition.

Some way must be found to provide more stable employment for wiremen. The new construction market, being either a feast or a famine, must be supplemented by a market that will iron out those sharp peaks and valleys. Fortunately the electrical construction industry has such a market that needs only the touch of salesmanship and promotion to spring into being—rewiring, the new uses for electricity, improved materials and devices, as well as defective wiring needing correction, have together provided a potential market that is many times greater than the market for new building wiring.

N.E.C.A. News..

Material for this department is supplied by the headquarters staff of the

National Electrical Contractors Association

420 Lexington Avenue, New York, N. Y.

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E. N. Peak	Louis Kalischer	Laurence W. Davis
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Change of Convention Date

The date for the holding of the Thirty-fourth Annual Convention of National Electrical Contractors Association at the Atlanta Biltmore Hotel, Atlanta, Ga., has been moved forward one week to Oct. 12, 13 and 14. The reason for this change is to avoid conflict of dates with the national convention of the electrical manufacturers scheduled for the preceding week.

Many electrical wholesalers and manufacturers have expressed a desire to attend the N.E.C.A. Convention at Atlanta and the present schedule of the three National Associations will permit of interchange of attendance.

Executive Committee Meeting at Mackinac

The mid-summer meeting of the N.E.C.A. Executive Committee will be held at the Grand Hotel, Mackinac Island, Mich., on July 20 to 23. The agenda includes many important Association activities now being carried on and reports will be submitted by President Peak and General Manager Davis covering their recent trips aggregating over 10,000 miles and including visits to more than sixty cities in the South and West. Plans will be discussed for the further cooperation by the electrical contractors in the program being developed by the Electrical Industry Promotion Committee.

ASSOCIATION HEADQUARTERS: Henderson's Electric shop in Jacksonville, Fla., is official headquarters for the local association. A separate telephone is maintained here for all its members to communicate with W. O. Henderson (left), association treasurer, about various contracting affairs. D. L. (Dixie) Carroll (right), former big league baseball player and now a successful local contractor, is a member of the executive board.

Directory of Local Associations

As the result of a questionnaire sent out by the N.E.C.A. to approximately 10,000 electrical contractors there has been compiled a directory of the names, addresses and officers of 164 local associations of electrical contractors in the United States, 6 local associations in Canada and 1 in Mexico City. One hundred and forty-four of the local associations in the United States reported an aggregate of 4,182 members.

The Directory of Local Associations is being printed in pamphlet form and will be sent to all local associations included in the directory and can be obtained upon request by any individuals desiring a copy upon remittance of 15 cents in stamps with their request.

New N.E.C.A. Manual of Labor Units

The N.E.C.A. Cost Data Committee, under the chairmanship of George W. Patterson of Toronto, have announced the release in July of a new N.E.C.A. Manual of Labor Units which enlarges the usefulness of the present Electragists' Estimating Manual. The manual will contain many new and important types of construction and is being published in loose-leaf form for ready reference by the electrical estimator rather than as a textbook on estimating. Reference will be found under each table in this new manual to the pages in the Electragists' Estimating Manual giving detailed explanations of the use of the data for those desiring a textbook on estimating. It is planned that sheets on new construction data will be issued from month to month and this manual of labor units will thereby be maintained constantly up to date.

The new N.E.C.A. Manual of Labor Units will not be sold but will be available to every paid-up member of the N.E.C.A. as a part of his membership service and members who have not already paid their dues are advised to immediately do so, so as to have their names on the mailing list when this new service is sent out to the membership.

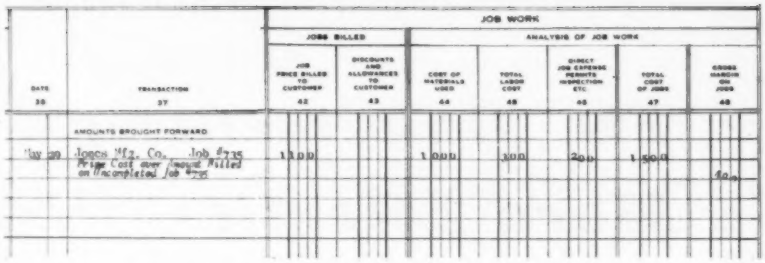
Accounting Practice on Uncompleted Contracts

The following inquiry has been received from a user of the Simplified Business Record System:

We have a $20,000.00 contract on which we have already expended $300.00 for labor, $200.00 for direct job expense, and $1,000.00 for material, or a total sum of $1,500.00. Under our contract we are only able to bill the customer $1,100.00 to date on this uncompleted contract. Should we enter these amounts in our Simplified Business Record exactly as shown, which will show an apparent loss of $400.00 on that project for the month when actually there is no loss as part of the accrued cost has not been killed?

The total amount of materials, labor and direct job expense charged to that particular job up to the time of the first billing should be entered in Columns 44, 45 and 46, and the amount billed to the customer entered in Column 42 whenever you bill the customer on account of an uncompleted job, even though the amounts charged to that job for prime cost aggregate more than the amount which it is possible to bill the customer at that time. This will show an apparent loss on that particular project to date and will, of course, affect the Profit and

MAJOR APPLIANCE SERVICE: Since moving in with a large retail appliance sales organization, D. E. Anderson of Orlando, Florida, handles all of this company's service and wiring problems as a part of his contracting business, and is also their specialist on heavy duty devices. Mr. Anderson is president of the Orlando contractors' association, comprising twelve members.



DATE	TRANSACTION	JOBS BILLED: JOB PRICE BILLED TO CUSTOMER	JOBS BILLED: DISCOUNTS AND ALLOWANCES TO CUSTOMER	JOB WORK: ANALYSIS OF JOB WORK: COST OF MATERIALS USED	TOTAL LABOR COST	DIRECT JOB EXPENSE PERMITS INSPECTION ETC.	TOTAL COST OF JOBS	GROSS MARGIN ON JOBS
35	37	42	43	44	45	46	47	48
	AMOUNTS BROUGHT FORWARD							
May 29	Jones Mfg. Co. Job #235 Prime Cost over Invoice Billed on Uncompleted Job #235	1100		1000	100	200	1300	40

Simplified Business Record uncompleted contract entries

Loss Statement for that particular month. However, to maintain the Simplified Business Record as a "simplified" system, the special liability accounts covering "deferred charges to cost of sales" and "partial payments on uncompleted contracts," with the journal entries necessary to cover this situation, have been discarded and it is recommended that only memorandum entries be kept through the Business Record which will call attention to this as an uncompleted transaction.

To enter any amount of billing on account to the customer on an uncompleted contract without entering the actual cost of materials, labor and direct job expense accrued to that time, would show a false profit which would be more misleading than the apparent loss resulting from a billing less than the cost. Arbitrary adjustment of the cost figures to exactly balance the amount billed so as to show neither profit nor loss would be unwise as such entries would give no indication of the actual progress on the job itself.

NOVEL LIGHTING JOB: In the center of this busy trio, snapped on the campus of Agnes Scott College, stands Ed Peters, Peters Electric Co., of Atlanta, Ga., discussing ways and means of putting into the concrete forms some 48 circuits controlling 350 odd stack light outlets in the library building for which he has a $9,000 wiring contract. C. B. Rutledge (left) is also interested because he has the panelboard order, and furthermore because he has had his fling at contracting problems in earlier days as executive secretary of the Memphis (Tenn.) Electrical Contractors Association. As for "Skipper" J. M. Eaton (right), he may have some good installation ideas, too, even though the boss has been contracting at Atlanta since 1906.

When a billing on account of an uncompleted contract is made where the total prime cost accrued to date is more than the amount which can be billed, all items should be entered in full exactly as shown on the job records. It is suggested then that a memorandum entry in red ink be made on the next line (Column 37) to read "Prime Cost Over Amount Billed on Uncompleted Job No. ——," and the difference between such cost and amount billed entered in red ink in Column 48 (which is a memorandum column not entering into the accumulated statement at the end of the month). If one or more of these red ink figures appear in any month they can be readily totaled and after taking off the Profit and Loss Statement for the month as provided for by the Simplified Business Record System this memorandum figure of "Prime Costs Over Amounts Billed on Uncompleted Jobs" can be entered as a red ink note at the end of the Profit and Loss Statement under the line "Total Net Gain (or Loss), Item (I)." This memorandum entry will permit of an instant valuation of the figures shown for profit or loss for that month without disturbing the actual accounting procedure of the system, and the discrepancy will correct itself in later months as the job approaches completion or is completed and final billing made.

Monthly Discrepancies

No simplified accounting procedure can show a true profit and loss statement for a single month. Not only will there be differences between the prime cost accrued and the amount billed on uncompleted jobs, but there are irregular fluctuations in overhead expenses resulting from the absorption of annual expense items in the overhead of a single month. A more complicated and thereby more expensive accounting system to maintain can take care of all of these discrepancies through the setting up of so-called deferred accounts and through journal entries allocating the proper proportion from month to month. For the medium and smaller sized businesses it is doubtful whether these refinements in accounting practice will justify the necessary increase in accounting cost which more elaborate systems require, and the Simplified Business Record has been designed to provide a practical accounting procedure at a minimum cost and effort.

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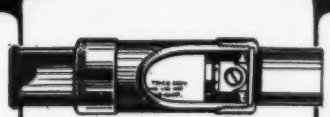

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Contracting .... News .....

Trial Installation Material Listing Clarified

The procedure for listing by Underwriters' Laboratories of trial installation materials, which recently gave rise to some misunderstandings, was extensively discussed at a two-day meeting held in New York on June 16 and 17 by officials of the Laboratories, and the Electrical Council and a complete understanding was reached. Whenever a trial installation is recommended by the Electrical Committee, N.F.P.A., Underwriters' Laboratories will investigate the materials intended to be used in such trial installation projects to determine the suitability for such use. The reports on such materials will be submitted to the Electrical Council in the usual manner. If the material is found acceptable, Laboratories will issue a listing clearly indicating the trial status of the product.

First REA Financing of Farm Wiring

The first loan for farm wiring installations to be made by the Rural Electrification Administration goes to the Pioneer Rural Electric Cooperative, Inc., Farm Bureau Building, Columbus, Ohio, which has secured $30,000 to be re-loaned to its members on three REA-financed projects in Miami, Shelby and Champaign counties, Ohio.

Under the terms of a contract approved June 18 the cooperative will amortize its loan in semi-annual installments over a five-year period, with interest at 3 per cent. The farmer will make a down payment to the contractor of not less than 20 per cent and will give a note to the cooperative for the balance, the latter paying the contractor in cash. The note at 6 per cent is to be paid by the farmer in ten semi-annual installments. The 3 per cent differential between the interest paid by and to the cooperative will be used to cover its expenses.

The contract also provides that wiring installations shall be made on a group basis by independent electrical contractors in accordance with plans and specifications approved by REA, which must call for first-class materials and make provision for possible future expansion to care for additional appliances.

No definite number has been set for the number of farms necessary to make a group contract. This will be determined largely by the local cooperative in accordance with conditions on the ground. The general principle recommended is to lump as many individual jobs as necessary to realize the advantages of mass operation, but not so many as to make the unit unwieldy.

In Ohio, the contractor will contract with the cooperative. Later it may be found preferable to have individual contracts between farmer and contractor, approved by the cooperative. No definite decision has been made by REA.

Plans and specifications will be prepared by the farmer and contractor as in any private job. The cooperative will check and approve plans, and while REA has technical authority to approve, it will not use it unless the cooperative becomes careless. REA will make available typical wiring plans and specifications for those who want them but will not make them mandatory. This plan was followed in putting through distribution lines.

Inspection will be by the cooperative's engineer, unless he is superceded by state laws requiring inspection by state officials or by underwriters' representatives.

First-class materials are not defined, but in general, they should meet specifications of National Electrical Safety Code and Underwriters Laboratories.

No definite standards for provision for future expansion have been made, but care will be taken to be sure that the plans are not too short-sighted.

REA has several other wiring loans in process, but approval is not expected until it gets the public reaction from this one. Pioneer is a separate cooperative formed for this purpose because the line-building cooperatives are restricted to their own counties. Appliances are not covered by this loan. They will be handled separately though possibly by the same cooperative.

New York Contractors Hold Record Meeting

With a record attendance of 130 the New York State Association of Electrical Contractors and Dealers held its thirty-seventh annual convention on June 22 to 25 at Big Moose, N. Y. While engineering and association work were discussed, the program was largely devoted to marketing opportunities for the contractor.

A paper on farm wiring by Professor L. D. Kelsey of Cornell University brought considerable discussion, when he made a plea for adequate farm wiring substantially installed by

SCHENECTADY'S ELECTRICAL JUBILEE: First event in the celebration of Schenectady's Half Century of Electrical Progress was the renaming of the city's new River Road in honor of the late E. W. Rice, Jr., a founder of the G-E Research Laboratory and General Electric's second president. At the entrance to the road, a huge stone boulder displaying a bronze plaque briefly describing Mr. Rice's achievements was unveiled by two of the electrical pioneer's grandsons, shown seated atop the boulder. Sponsored by the local chamber of commerce, Schenectady's Half Century of Electrical Progress was celebrated in that city June 12 and 13 to commemorate the establishment of the electrical industry there by Thomas Alva Edison. It was fifty years ago on June 14, that Edison took title to two abandoned shops of the McQueen Locomotive Company as a new location for the Edison Machine Works, thus laying the foundation for a local industry which later developed into the present General Electric Company.

The outstanding event of the two-day celebration was a formal dinner on Friday evening for more than 500 invited guests at which the chief speakers were Owen D. Young, chairman of the G-E board of directors, Dr. George R. Lunn, New York state public service commissioner, Charles A. Edison, son of the famous inventor, and W. S. Barstow, Edison Pioneer and president of the Thomas Edison Foundation.

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DUTCH BRAND Rubber Insulating Tape
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competent wiremen. The other papers read at the program were "Highway Lighting" by Dudley Diggs, General Electric Company; "Contractors' Relation to the Housing Problem of Tomorrow" by L. F. Giblin, General Electric Company; "Industry Benefits from Load Building Activities" by Dr. G. W. Allison, Edison Electric Institute; "The New Electrical Industry Promotion Program" by L. W. Davis, general manager, N.E.C.A.; "The Contractor's Field and His Opportunities" by A. Lincoln Bush; "Social Security" by Bert Kirkman, president, Local No. 3, I.B.E.W., "Current Carrying Capacity Under Different Conditions" by Samuel Rosch, Anaconda Wire and Cable Corporation; "Advantages of Safecote for Modern Installation" by A. Penn Denton; "How Qualified Wholesalers Benefit Contractors" by Elmer Jones, Havens Electric Company; "Lighting Developments in 1935 and 1936" by S. G. Hibben, Westinghouse Lamp Company.

The same officers were re-elected to serve for another year.

Construction Industry Facts

The cost per $1,000 of construction contract for materials in 1929 was $429 of which the amount for electrical materials was $27, according to a compilation entitled "The Construction Industry, Including a List of Selected Trade Associations" recently issued by the Marketing Research Division of the Department of Commerce.

The book, besides containing a brief analysis of the broad economic facts relating to the activities of the construction industry, includes a list of the major federal agencies carrying on construction work.

New Officers Elected

The following new officers have been elected for the Contractors Division of the Cincinnati (Ohio) Electrical Association: President, A. X. Schwebel; vice-president, Aaron Wottitz; secretary, J. F. Riehle; treasurer, Errett W. Edmonds; board of directors (in addition to the above officers), Arthur E. Bertke, Charles P. Fisher, Samuel F. Keller, E. S. Kerchner, and A. L. Racke.

2,700 THEATRE SOUND JOBS: Pausing for the moment in their 45 f.c. lighted estimating room, Chas. A. Mayer, proprietor (right), and C. H. (Charley) Whitehead, electrical engineer, of the Electrical Engineering & Repair Co., Atlanta, Ga., report business definitely on the upgrade. In recent years they have done some 2,700 theatre sound jobs in nine states, totalling 1½ million dollars; a $400,000 wiring job in a manganese mining plant that had 4,600 hp. in motors and required 175 wiremen at the peak; the $168,000 wiring job in Atlanta's Hart Bldg., and many jails and public buildings. Mr. Whitehead is secretary-treasurer of the Georgia Electrical Contractors' Association, Inc.

Union Electrician Wage and Hour Statistics

The research department of the International Brotherhood of Electrical Workers has presented in the June issue of the *Journal of Electrical Workers and Operators* the findings of its first five years of statistical research into the hours worked and wages received by members. The data covering inside wiremen is presented in the accompanying table.

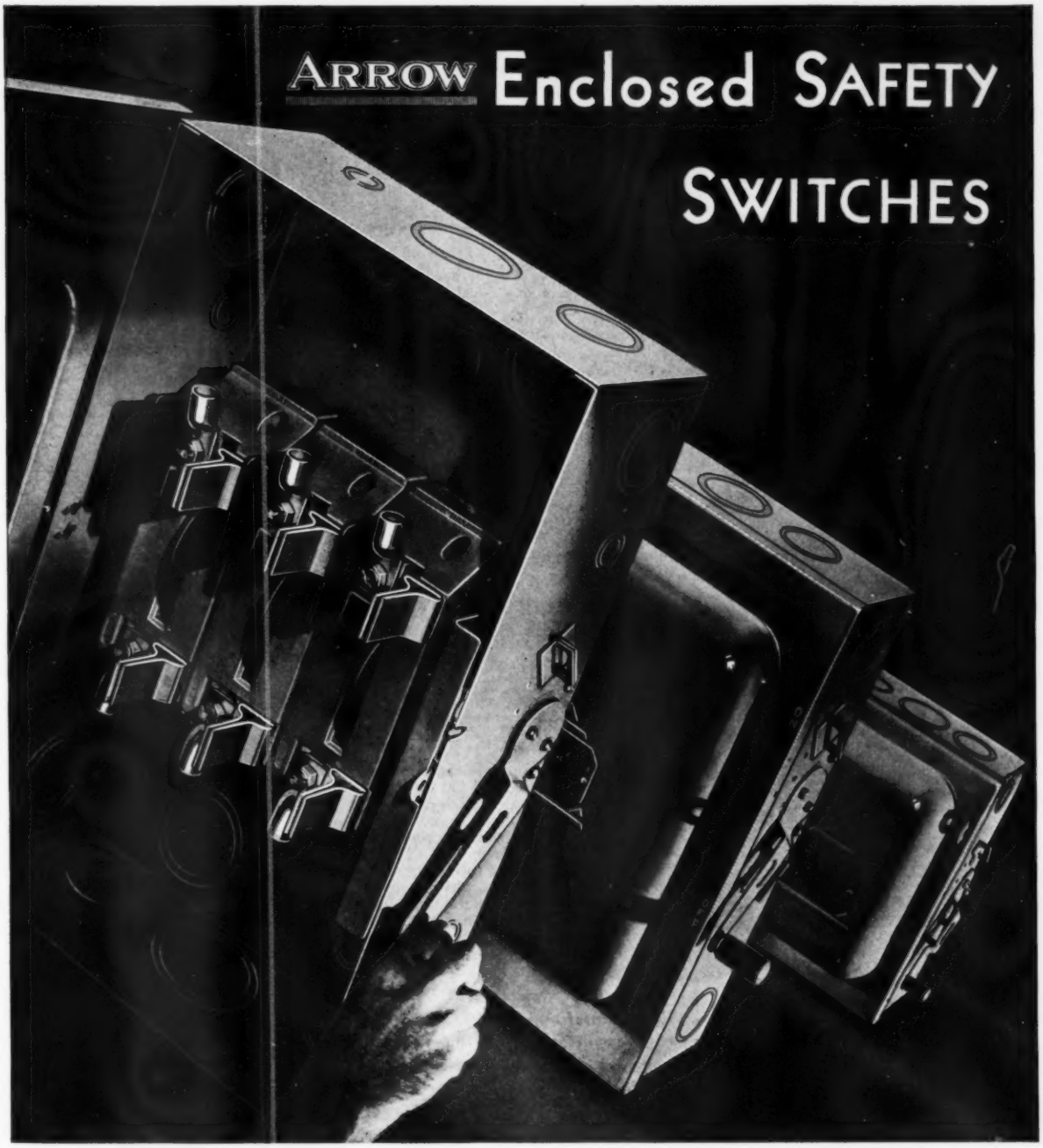
The full time work year was placed at 1920 hours which represents a 48-week year of 40 hours per week.

To Investigate Fuse Heating in Switches

As the result of numerous complaints regarding the heating of fuses in enclosed switches Underwriters' Laboratories will undertake an investigation of this problem not only with respect to the actual temperature rise of the fuses in such enclosures, but more particularly as to the effect of such heating on the rating of the fuses.

Five Year Wage and Hour Averages for Union Inside Wiremen

	1931	*1932*	*1933*	*1934*	*1935*
Average Number of Hours Worked per Man	887	604	514	669	898
Average Hourly Wage Rate	$1.14	$1.05	$1.05	$1.01	$1.12
Average Annual Income per Man	$1,011	$ 634	$ 540	$ 676	$1,006
Per Cent of Full Time Employed	46.2%	31.4%	26.8%	34.9%	46.8%



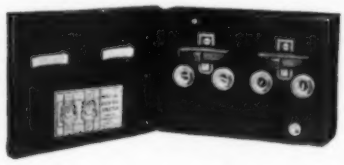
All moving parts are safely enclosed. The wiring gutters are roomy and unobstructed, for front wiring. Switch mechanism has full floating contacts, with double break in each leg. Vulcoid rotor acts as flash barrier; completely separates each break. The arc breaks in a porcelain well. Ventilated contacts give ample air space for the break. The vulcoid rotors are highly resistant to charring and moisture penetration... This *complete line* of switches carries H. P. ratings in addition to Ampere ratings. All have attractive gray enamel finish, with red identifying label. Send for Safety Starting Switch Catalog No. 6.

ARROW ELECTRIC DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

New Products . for July . . . .

Water Heater Switch

A dead front assembly of two 2-pole switches and four plug fuse connections in a cabinet, which is recommended as a two-circuit water heater control switch.



A dead front plate which covers wire connections and the switch mechanism is held in place by a stud and nut. This nut may be sealed to prevent tampering, while the switch levers may be padlocked in the "on" or "off" position, because of specially shaped guards on cover of the enclosing case. Cutler-Hammer, Inc., Milwaukee, Wis.

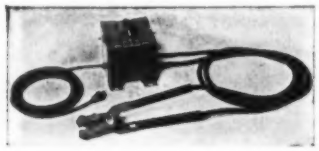
Industrial Sockets

A line of key sockets in the threaded and pendent cap types, in which the porcelain body extends through the shell to

form an insulated support and bushing for the key shaft. The keys are finished red, while the shells are finished with gray insulating enamel. The Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

Soldering Pliers

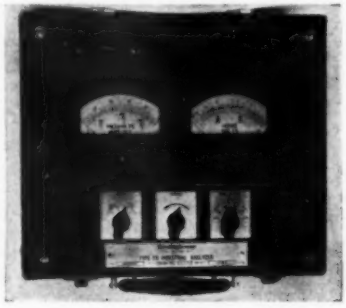
Electrically heated carbon-tipped plier jaws provide a tool which performs the dual function of holding the work while heating it to solder melting temperature. Recommended for applying or removing



solder lugs, for soldering stator connections in motors, for melting solder in a thimble, and for other soldering jobs. Equipped with two-position plier jaws with heat insulating fibre tube handles, two-heat switch control, 550-watt transformer, with flexible primary cord connection, and single conductor secondary soldering cables. The carbon plier jaw tips are renewable. Ideal Commutator Dresser Co., Sycamore, Ill.

D.C. Industrial Analyzer

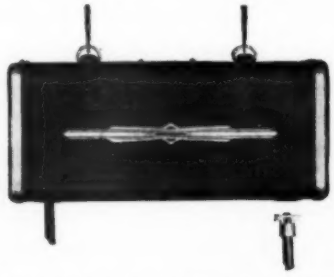
A compact instrument for testing d.c. motors and control equipment, consisting of an ammeter, a volt-ohmmeter with shunts, and multipliers and range changing switches all mounted in one case.



The industrial analyzer is recommended for testing d.c. motors of 150 to 750 v., and of 4 to 750 amps., and motor ratings of ½ to 600 hp. A low range 0/15-v. scale is included for voltage drop tests, also a 50 millivolt scale for use with external shunts. Features of design are: Elimination of extra test wiring connections, reduction of errors and injuries, less confusion in making tests, and simultaneous readings obtainable in one compact instrument. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Sign Transformer

Luminous tube transformers which permit connecting the sign by cable leads or by inserting it directly into the electrode housing. Hanger brackets are provided



with each unit, and rubber feet are already mounted on the case. Other features: double steel shell around the core and coils; compound filled inner case; glossy black japan finish with chrome-finished end-caps and silver striping. General Electric Co., Schenectady, N. Y.

Interchangeable Floodlight

The MUA line of floodlights is designed to use one reflector head for supporting nine types of reflectors. This head fits three types of mountings, namely

slip-fitter, cross-arm or pole-bracket types. The floodlights may be had in Elliptalux, Multalux or Alumalux reflectors, the latter type including plain, diffusing or spread lenses or hoods as optional items. Beam spreads from 20 to 115 deg. can be supplied. Crouse-Hinds Co., Syracuse, N. Y.

Porcelain Outlet Boxes

A line of porcelain outlet and switch boxes for use with knob and tube, and other insulated systems of wiring. Conductors are brought into boxes after thin-

wall knockouts are punched out of the thicker box wall. Any jagged knockout edges remaining are easily reamed smooth with a screwdriver. Box mounting holes and knockouts are provided. Wiring devices are fastened to the boxes by means of metal inserts. Porcelain Products Co., Findlay, Ohio.

Alcohol Torch

The No. 30 self-blowing alcohol torch is said to produce a small pointed flame of great heat intensity. It is claimed to operate when turned sideways or upside-down without affecting the flame or without leaking fuel. Its handles fold away to the sides when not used as supports or rests, thus making it a compact unit to

26 YEARS OF *Uninterrupted Service*

This bus, composed of ½-inch x 10-inch Alcoa Aluminum bars, was installed in 1910 with plain, sanded joints. Although it has been exposed to atmospheres of varying but relatively high humidity, it has given 26 years of uninterrupted, trouble-free service.

Resistance to corrosion is only one of the advantages inherent in Aluminum bus bar. Others derive from the fact that it is at least 52% lighter. Longer spans between supports are entirely practical. Often Aluminum bus can be placed overhead, without need for special supports in addition to existing beams and braces; space is thus conserved.

For the utmost stiffness and strength in a bus-run to carry very heavy loads, Channeluminum is employed. For lighter loads, flats, angles, and tubes do the job. Simple, inexpensive fittings are used. Efficient, trouble-free connections are easily secured by welding, or by bolting.

Ease of erection and long trouble-free service make Alcoa Aluminum bus less expensive and more satisfactory. We have prepared complete information concerning it, which we will be glad to send to those interested. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Pennsylvania.

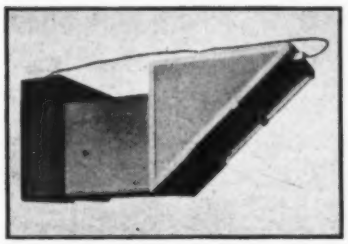
ALCOA

ALCOA · ALUMINUM

carry. Because of its small size it is handy for electricians and radio men to use in crowded spaces. Otto Bernz Co., Inc., Rochester, N. Y.

Attic Ventilator

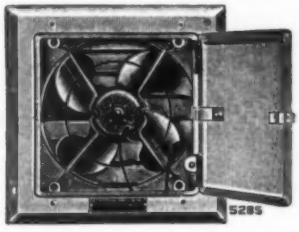
The Viking attic Circoolator combines in a single kit the following attic cooling equipment: Rubber-mounted fan, vent box with attic connection, ceiling register, pulleys, rope, fittings and automatic mo-



tor starting switch. Made in 30-in., 36-in., and 45-in. sizes, which are rated 6,100, 10,000 and 15,000-c.f.m. capacities. The fan is claimed to be extremely quiet because of its slow-speed V-belt drive. The motor is mounted on a self-adjusting base for maintaining constant belt tension, and the entire fan and motor assembly are mounted on rubber cushions. Vibration is said to be completely eliminated. Viking Air Conditioner Corp., Cleveland, O.

Ventilating Fan

The "Seabreeze" line of ventilating fans may be had in the wall-box or in the adjustable window-panel type. The



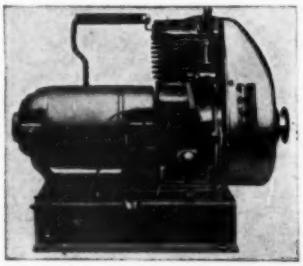
box type is adjustable to wall thickness, and has an automatic door-jamb starting and stopping switch. Both models employ motors with self-aligning wool-packed bronze bearings with felt-packed oil reservoirs. The standard finish is washable French grey. The Emerson Electric Mfg. Co., St. Louis, Mo.

Severe-Use D.C. Motor

Type SK d.c. motors are fan-cooled totally enclosed, and are recommended for use in foundries, cement plants and other industrial service where abrasive and metallic dust is present. They are also recommended for chemical plants, dye houses and other service where splashing liquids or mild chemicals are encountered. The enclosures are said to exclude foreign matter from the interior of the motor, and also protect against the entrance of splashing water as occurs during the hosing of floors and walls. Only one cover need be removed to examine the brushes or commutator. Sizes range from 5 to 75 hp. for 115, 230 and 550 V., d.c. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

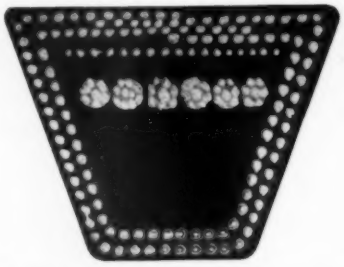
Portable Lighting Plant

A 50-lb., 300-watt portable power and lighting plant, furnishing 110-v., 60-cy. a.c. The plant is equipped with handle



for convenient carrying, and the generator is directly connected to and mounted on the engine block. Its fuel tank is contained in the base, and the unit is said to operate without being bolted down. A radio interference elimination device is provided. Also made in plants of 150 watts, 6 v.; 200 watts, 12 v.; 300 watts, 32 v.; and 300 watts, 110 v. d.c. Kato Engineering Co., Mankato, Minn.

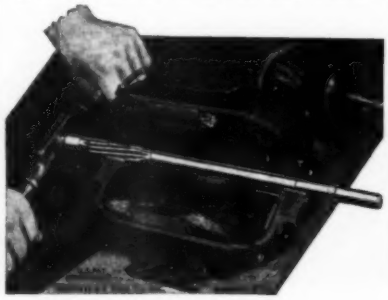
Small Motor Belts



Cable cord type "V" belts for fractional horsepower oil burners, stokers, pumps, compressors, and other machinery are made in about 100 styles of A and B cross sections. Long-wearing covers, a fabric filler to provide transverse strength without loss of flexibility, and rubber-impregnated tension cords built to resist stretch, to provide longitudinal strength and a low heat generating cushion base are featured claims. B. F. Goodrich Co., Akron, O.

Bearing Reamer

A tool for reaming motor shaft bushings designed in sizes ranging from $\frac{3}{4}$ to $\frac{13}{16}$-in., and 10 in. to $18\frac{3}{4}$ in. long overall.



Said to be self-aligning and internal expanding, it employs a spiral fluted reamer that is guided by a long pilot which is centered in a tapered floating collet placed in the opposite bearing. The size of the reamer is set by an adjusting plug in the head which expands the reamer very slowly. Range of expansion is from .370 in. to .378 in. for the $\frac{3}{8}$-in. size and .805 in. to .818 in. for the $\frac{13}{16}$-in. size. Watervliet Tool Co., Inc., Albany, N. Y.

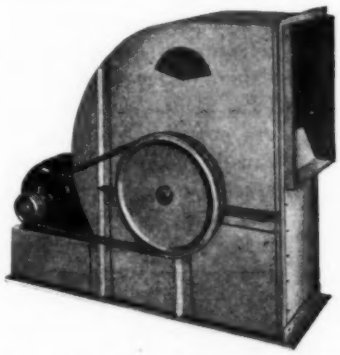
Supports for Commutator Grinders

A line of supports for Ideal Precision grinders that are claimed to give wider adaptability, better performance, truer and

faster work in grinding commutators or slip ring. The type OE support illustrated can be attached to the motor to provide a flexible yet rigid base for the grinder without obstructing the operator, and without dismantling brush holders or rigging. Ideal Commutator Dresser Co., Sycamore, Ill.

Unit Blower

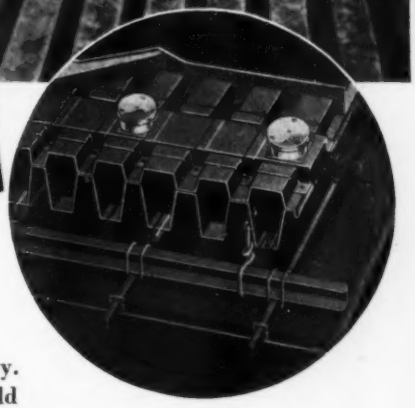
A Uniblade unit blower employing an integrally mounted motor with V-belt drive, for installations where there is a preference for belt-driven, over direct-



driven blowers. This line is offered in five sizes, to which certain motor ratings from 1/6 to 2 hp. may be applied, giving a wide range of capacities and blower speeds. The blower ratings are all based on the use of 1,750 r.p.m. motors of various sizes, thus claiming maximum motor drive efficiency. Motor mountings are designed for standard frame sizes to simplify the interchange of motors at any time. Autovent Fan & Blower Co., Chicago, Ill.

A TYPICAL *office building that has been arranged for the distribution of two systems of wiring. In the foreground is one of the 8 headers crossing this area.*

Now... A STEEL FLOOR THAT FACILITATES THE DISTRIBUTION OF WIRING



THE Robertson Steel Floor deserves the close attention of every electrical engineer and contractor. It is primarily a structural member, but . . . and here's the revolutionary feature of it . . . it can be readily and advantageously adapted for the distribution of wiring.

The floor is composed of hollow steel cells. The capacity of each cell is generous. And every cell can be used as a protected wire raceway. What such wiring facilities could mean to the modern building is obvious. Electrical needs, both present and future, can be met by the building owner economically, safely and conveniently. Premature electrical obsolescence is prevented. Your customer gets a better job . . . good for a longer time.

We have prepared a brochure called "New Life for Buildings" describing the Robertson Steel Floor Wiring System in some detail. Send for it. It's free. And ask, at the same time, for our technical bulletin, containing valuable information. Address H. H. Robertson Company, 2003 Grant Building, Pittsburgh, Pennsylvania.

ROBERTSON STEEL FLOOR WIRING SYSTEM

Trade Notes . .

Everett Morss, Jr., New Simplex Wire Head

Everett Morss, Jr., formerly vice-president, clerk and secretary of the Simplex Wire & Cable Company, Boston, has been elected president and treasurer, following the death of Henry A. Morss. Charles R. Boggs, vice-president, has been elected general manager as well. He was previously factory manager. Vice-president Philip R. Morss has been made clerk and secretary, continuing in his previous post, and assistant treasurer J. Arthur Gibson has also been made a vice-president. Sales Manager Willam S. Davis and Assistant Sales Manager Geo. L. Roberts, were re-elected.

J. W. Whittington has recently been appointed by the Electrical Cord Manufacturers to take over the work of James A. Smith in the promotion of approved flexible cord. Mr. Whittington comes to NEMA from the Electrical Testing Laboratories where he has been active in the I.E.S. Lamp campaign.

Past affiliations include Underwriters' Laboratories, Inc., and the National Electric Light Association.

Laclede Steel Co., St. Louis, Mo., announces the appointment of Rick & Selleg, 549 W. Washington St., Chicago, Ill., as its agents.

McGill Manufacturing Co., Valparaiso, Ind., announces the appointment of Turrel & Benfield, Architects Bldg., Detroit, Mich., as its Michigan sales representative.

The Cinaudagraph Corp., Stamford, Conn., announces the appointment of Roy W. Augustine as sales manager for its midwestern district, and the appointment of Halton H. Friend to have charge of the Magnet Steel Division at the Stamford plant.

S. H. Couch Co., Inc, North Quincy, Mass., announces the appointment of Wesley Block & Co., 15 E. 26th St., New York, N. Y., as sales agent in the metropolitan New York district for a part of its line of equipment.

Edward J. McCarthy has been appointed general sales manager of the Gamewell Co., Newton, Mass. Mr. McCarthy has been in this company's employ for over sixteen years, having been district sales manager for the New England States for the past four years.

Curtis Lighting Inc., Chicago, Ill., has appointed Harold R. Eldredge, formerly secretary-treasurer of Curtis Lighting of New York, Inc., New York sales manager of Curtis Lighting, Inc., to be in charge of all Curtis sales activities in the metropolitan New York district. Mr. Eldredge became associated with the company in 1913.

American Engineering Co., Philadelphia, Pa., announces the appointment of John F. Cooke to have charge of the hoist, pump and marine division sales. Its New York offices have been moved to larger quarters in the Evening Post Bldg., 75 West St.

Graybar Electric Co., Inc., New York, N. Y., announces the following changes in its organization: Earl W. Cashman, former service manager at Chicago, has been transferred to New York in the capacity of service manager; Roland D. Paine, former service manager at Cleveland, has been transferred to Chicago as service manager; Adam E. Kostulski has been appointed service manager at Cleveland; and Karl Bernard Mayer has been appointed sales manager of the Akron Branch.

The All-Steel-Equip Co., Aurora, Ill., announces the appointment of H. L. Breitenstein as district manager, with headquarters at 311 Donovan Bldg., Detroit, Mich. Mr. Breitenstein has been with the company for twelve years.

Trade . . . . . .

Literature . . .

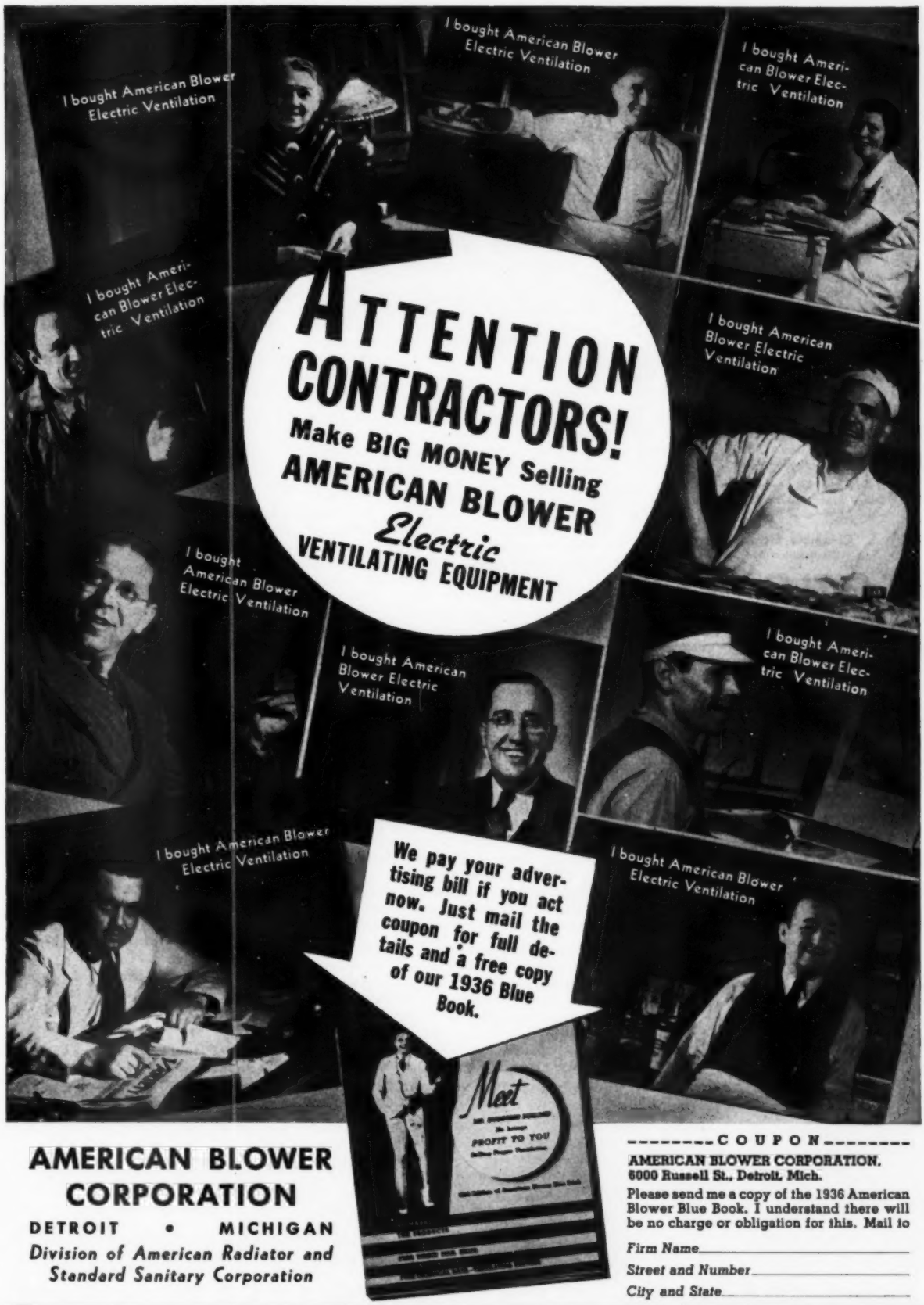
Lugs and Terminals: Trade Bulletin No. 37 covers soldering lugs, solderless lugs, fuse clips, terminals, and other accessories. Dante Electric Manufacturing Co., Bantam, Conn.

Non-Corrosive Conduit: A promotional folder illustrating the methods employed during the installation of Everdur conduits on the Delaware River Bridge. American Brass Co., Waterbury, Conn.

Baseball Lighting: Bulletin 2516 is a combination of three bulletins related to baseball field lighting. This data comprises 51 pages of suggested layouts, bills of material, and summary sheets for pricing the required materials. Crouse-Hinds Co., Syracuse, N. Y.

Lighting Equipment: A 51-page bulletin No. 6-B covering porcelain enamelled reflector sockets, reflectors, outdoor fixtures, flood lights and accessories. Multi Electrical Mfg. Co., Chicago, Ill.

Floodlighting Manual: A 34-page book entitled "What Every Service Station Operator Should Know About Lighting" gives principles of floodlighting service stations; how to floodlight grounds and buildings at the same time; how to light pump islands, greasing pits, wash racks and other parts of the station. A lighting check



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DETROIT • MICHIGAN

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Please send me a copy of the 1936 American Blower Blue Book. I understand there will be no charge or obligation for this. Mail to

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chart is included with illustrations, photographs, diagrams and other data. Benjamin Electric Mfg. Co., Des Plaines, Ill.

Fans and Blowers: A loose-leaf catalog combining all literature covering "Autovent" fans, blowers, air conditioning and unit heater units. Autovent Fan & Blower Co., Chicago, Ill.

Rotary Converters: A 4-page bulletin, No. 13-25, covering small rotary converters and gasoline electric plants ranging from 30 to 650 watts, and from 6 volts to 230 volts. Janette Manufacturing Co., Chicago, Ill.

Lumiline Fixtures: A 2-page folder illustrating and describing the "White" Lume-I-Lite line of fixtures using lumiline lamps for picture reflectors, pulpit lights, piano and music fixtures and portables. The O. C. White Co., Worcester, Mass.

Pole Derricks: A 20-page bulletin describing six types of pole derricks for line construction work. Various featured fittings are described. Operating suggestions are included. Graybar Electric Co., New York, N. Y.

Floodlights: Utility floodlights of wide beam spread characteristics, for indoor or outdoor mounting on posts, or for flush or exposed installation on walls. Bulletin No. 199. The Pyle National Co., Chicago, Ill.

Solderless Lugs: An illustrated folder describing three step-by-step ways to make up K & H No. 1021 lugs without solder. Krueger & Hudepohl, Cincinnati, O.

Megohmer: The Junior Paragon constant pressure megohmer is described in bulletin No. 415. Herman H. Sticht & Co., New York, N. Y.

Motor Bearings: A 32-page catalog No. EN-6 listing bearings and bushings for various sizes and makes of electric motors. Parts are listed alphabetically by various makes and types. A progressive size chart is included, also a listing of miscellaneous bronze bars. Johnson Bronze Co., New Castle, Penna.

Sound Equipment: A 12-page bulletin listing portable sound equipment systems for operation on 110 and 220-volt service, also for operation from automobile batteries. Amplifiers, preamplifiers, field exciters, line matching transformers, microphones and stands, horns, trumpets and other accessories are also listed. Radio-Amplifier Laboratories, New York, N. Y.

Enclosed Switch Data: The 24-page "Use" Bulletin No. 133 contains charts and illustrations defining the three general classifications of enclosed switches and their recommended applications. Comprehensive descriptive matter makes comparisons easier between these types by means of explanations of their distinguishing principles of operation and construction. Several wiring tables are included, together with a 2-page quick-reference summary of Trumbull switches arranged by catalog number, ampere ratings, number of poles and types. The Trumbull Electric Mfg. Co., Plainville, Conn.

Commutator Grinder Mountings: A folder illustrating mounting attachments that have been developed for the various models of precision commutator and slip-ring grinders. Ideal Commutator Dresser Co., Sycamore, Ill.

Outlet and Conduit Fittings: Bulletin No. 1021, 44 pages, lists Appleton outlet and switch boxes, conduit fittings, box supporting hangers, pipe hangers, fixture hangers, benders and other miscellaneous items. Appleton Electric Co., Chicago, Ill.

Transformers: Two folders, one dealing with the design and step-by-step story of building power transformers; the other folder illustrates and describes the details of construction of power units up to 5,000 k.v.a. and up to 66,000 volts. R. E. Uptegraff Manufacturing Co., Pittsburgh, Pa.

Safety Switches: A 48-page Catalogue No. 36 listing safety switches in heavy duty, general service, meter service, main entrance, and magnetic types. Meter test blocks, relays, meter troughs and other accessories are also covered. The Palmer Electric & Manufacturing Co., Waltham, Mass.

Motor Maintenance Data: Two "Brush Selection Charts" giving condensed data covering carbon and metal brushes. These charts explain a charting service booklet which may be obtained from the company to cover the complete motor maintenance history of a specific plant. The Ohio Carbon Co., Lakewood, O.

Fan Bulletins: Bulletin No. 12 describes the "Air-flow" line of propeller fans including detail dimensions for automatic shutters; No. 13 covers penthouse exhausters; and No. 14 covers "Air-flow" home ventilators for attic installation. National Fan and Blower Corp., Chicago, Ill.

Interchanageable Button Stations: A folder describing a line of interchangeable push button control and pilot light units which may be combined in units of three devices to provide ten or more types of control combinations. The Arrow Hart & Hegeman Electric Co., Hartford, Conn.

Outlet Planning Folder: A 2-page folder describing how to use the Collins outlet planner in making layouts for adequate extension wiring. Descriptive information covering "Add-here" wiring and other wiring devices is included. The Bryant Electric Co., Bridgeport, Conn.

Magnet Wire Standards: Publication 36-34 entitled "NEMA Magnet Wire Standards" contains standards for cotton covered, silk covered and enameled round copper magnet wire. A 16-page, 8 in. by 10½ in. pamphlet. National Electrical Manufacturers Association, New York, N. Y.

. . . . "The Buyers Reference Number supplied buying information that helped close this deal in less than eight hours"

An electrical contractor in the west recently had an opportunity to get in a "last minute" bid on a line of ventilating fans different from those quoted by competitors.

From his Buyers Reference, he selected a manufacturer who had supplemented listings with further details, including branch offices. A telephone call to the nearest office brought an exact quotation—and in less than eight hours he had closed the deal.

This is typical of thousands of cases where the Buyers Reference has helped buyers find out *What to Buy, Where to Buy* and *Who Makes It.*

You, too, can enjoy these advantages. Keep your copy of this valuable book handy.

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BUYERS REFERENCE NUMBER OF ELECTRICAL CONTRACTING

— to save time and money in your buying

Advertisers' Index

easy to use • accurate • and SAFE

● Testing voltages and frequencies with lamps is inconvenient and generally unsatisfactory.

It is inaccurate as well as hazardous. A different lamp is required for every voltage and there is always serious danger when lamps break.

The Square D Voltage Tester is accurate. It indicates whether the current is A. C. or D. C.

It is easy to use. Simply place one wire on each side of the circuit and the voltage is shown by the indicator.

Its long, rubber-covered lead wires are fitted with hooks—also sharp points which make it possible to pierce the insulation of the circuit wires without destroying the insulation.

These wires are brought out through the bottom cap through two separate holes, providing good insulation and preventing wear. Further protection is provided by two wire armors.

Coming in contact with all kinds of services, as you do, the Square D Voltage Tester is a quick and accurate means of determining what the voltage and the type of service is. You can procure these testers through your nearest Square D distributor.

CALL IN A SQUARE D MAN

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

SQUARE D COMPANY CANADA LTD. TORONTO, ONTARIO

G-E WIRING MATERIALS

THE LINK TO PROFITS

G-E Wiring Materials link you to profits in three ways: by the completeness of the line, by ease of installation and by consumer satisfaction.

(1) The G-E Line includes the proper materials for any sort of wiring installation. It isn't necessary to waste time shopping around to find the right thing—G-E Distributors have it. (2) G-E Wiring Materials are designed to be used together. They fit accurately and may be installed quickly. Their high quality is always uniform. (3) G-E Wiring Materials assure consumer satisfaction because their use helps to assure trouble-free service and flexibility. Your finished G-E jobs will be your best advertisements—the foundation for increased profitable business.

Recently General Electric introduced the Branch-circuit Circuit Breaker and the Radial Wiring System — both will sell adequate wiring jobs for you. For complete information on these new developments or on all G-E Wiring Materials see your nearest G-E Distributor or write to Section CDW-687, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

WIRING MATERIALS

APPLIANCE AND MERCHANDISE DEPT., GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONN.